

### Lecturers join students as protest over higher tuition fees goes on

By Frances Gibb  
The National Union of Students' campaign against increased tuition fees reached a climax this week with a march by some 10,000 students in London and rallies at Leeds, Exeter and Glasgow.  
Occupations were still taking place throughout the country at more than 30 colleges, and students at the London School of Economics voted to defy a court order and re-occupy the school's premises.  
The students were joined by lecturers, and among the marchers in London was expected to be Sir Brian Flowers, rector of Imperial College, London. Dr Frank Thistlethwaite, vice-chancellor of East Anglia University, encouraged staff to rearrange teaching to enable students to attend the rally.  
In London, students lobbied MPs and presented a letter to Mrs Williams, Secretary of State for Education and Science, in answer to her invitation to meet and discuss fees.  
Mrs Williams said demonstrations were hardly the best way to advance an argument. She was worried resources which would be better devoted to helping students in financial difficulties.  
The savings to be made from higher fees had to be found from higher and further education, and there could be no question of seeking further savings from other parts of the education budget.  
As a developed country, Britain had no obligation to poorer countries. "But I see no reason why this obligation should extend to poorer countries better off than ourselves, or why British taxpayers should heavily subsidize students from those countries."  
Universities hoped to be able to

give assistance to students from home or overseas already on course, she said. Student bodies were also not without resources, and she would be impressed by their willingness to help those affected.  
In reply the NUS welcomed the possibility of a meeting, and said it wished to discuss in particular the grants review, with reference to discretionary grants and parental means testing, and fees. It would be seeking a commitment that no student should be forced to leave a course through financial hardship. It also wanted a debate with all educational bodies on possible alternative methods of funding education.  
The week of action claimed some successes. The NUS said that Brunel, Dundee, Bath and Northern Ireland Polytechnic had agreed in principle that they were against increasing fees for self-financed students. In mid-course and Harrow College of Further Education had set up a joint working party of governors and students to ensure that no student was forced to leave a course through financial hardship.  
The NUS has sent letters to all 54 other national student unions asking for their support. It is concerned that other countries will retaliate and set off a chain reaction which could lead to the end of educational exchanges between British and overseas students.  
Last week Bradford University sent letters to all university senates calling for a conference on tuition fees. Warwick and Essex have agreed to a conference, and others, while expressing concern, have said the matter has yet to be discussed with their senates. Some universities wish to deal directly through the Committee of Vice-Chancellors and Principals.

At the Royal College of Art, where students have been in occupation for nearly two weeks, the rector, Lord Escher, told a meeting of the college that he was against the Government's policy and would join other institutions to try to force a reversal of the policy. But the college had to implement the new fees.  
A joint statement from the Reverend George Tooley, principal of Sheffield City Polytechnic, and the president of the polytechnic student union said it was reprehensible that since the fees announcement there had been no guidance on how to deal with hardship cases. There had been no adequate public debate on issues of "fundamental importance".  
Among student unions in occupation this week were: Croydon Technical College, Crawley Technical College, The Slade School of Art, Central School of Art and Design, York University, Herdons College, Leeds University Brunel University, City University, North East London Polytechnic, Polytechnic of North London, and the New University of Ulster.  
The World University Service urged all student unions this week to lobby Dr David Owen, Secretary of State for Foreign and Commonwealth Affairs, and Mrs Williams, to make special provision in the form of scholarships for refugee students and students from developing countries.  
WUS said it believed it was on the point of success in its campaign on these issues. In recent speeches both ministers had indicated that they were sympathetic to the plight of such students.

### Fear the spur behind unrest

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was that an expansion of higher education would lead to an expansion of opportunities comparable to those open to university graduates 15 years ago.  
In so far as the expansion of higher education was motivated by pseudo-economic objectives, it was bound to lead to limits to growth at an early date, and to tremendous individual frustrations in the bargain. Yes, education is a civil right, but that is so because it is in itself worthwhile, like travel, or some kinds of work, rather than because it promises a certain income or status.  
Perhaps the present crisis of education will teach us a useful lesson about the limits of the much-exaggerated link between the educational and the occupational systems, and thus give education its proper place.  
Until that has happened, however, the new restlessness of educational protestants is likely to be with us, and it will be unpleasant. For there are other features which distinguish 1977 from 1958: demands for the maintenance of

the status quo ("no cuts", "no fee increases") are often desperate, especially if they run counter to the prevailing trends of public opinion. Since they are not likely to be satisfied to any significant extent, it is difficult to see how the causes of the restlessness which they provoke can be removed.  
Moreover, declining groups are less able to resist intimidation by organized groups which claim to represent them. Those who are afraid of their future, and are quite likely to find in 10 years' time that they were right, whereas those who demanded a place in the sun 10 years ago may well have found it by their own effort.  
In one's fears, it is not to be denied, one is likely to be vulnerable, or at any rate less immune to the bug of intimidation.  
Altogether, students today reflect the plight of many groups in our society, clinging to what they have got rather than groping for something new—and one must hope that this is not a mood which will determine the politics of the 1980s.  
The author is director of the LSI and a THES columnist.

### FE teachers seek pay talks overhaul

Further education teachers, frustrated by local authorities' slow progress in implementing a favourable condition of service agreement, are to call for a thorough overhaul of pay and conditions negotiating machinery.  
The National Association of Teachers in Further and Higher Education is proposing the abolition of the Burnham machinery and its replacement with a non-party body dealing with both pay and conditions.  
The effect would be to reduce the freedom of local authorities to act independently, while freeing the teachers from what they regard as the antiquated legal restraints of existing pay machinery.  
NATFHE also wants to remove the DES from national salary negotiations.  
The scheme for a new national joint committee was decided at the association's annual conference last weekend, and will be put to other further education teachers' organizations before being passed to the Council of Local Education Authorities and the Government.  
The new body, comprised of teachers' representatives and representatives of CLEA alone, would have an independent chairman nominated by the Advisory Conciliation and Arbitration Service. It would depart from the Burnham system of annual salary negotiations and could negotiate on conditions and pay separately at any time.  
NATFHE also proposes a parallel regional negotiating machinery, mainly to resolve local disputes.

### 'Halt genetic engineering' call

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between distant organisms which have not been demonstrated to exchange genes in nature."  
The group, supported by the Friends of the Earth, claims over 400 sponsors from the United States, Britain and eight other countries where DNA research is about to begin.  
Dr Wald, one of the panelists at the Academy meeting, said this research was "perhaps the biggest issue in the history of science and that experiments might constitute the biggest threat with nature that has occurred in human history."  
He asked whether any scientist should have "three billion years of

evolution turned over to them for essentially—messing around."  
Dr Wald emphasized that his group does not oppose genetic research as such—they were not trying to stifle scientific inquiry. It was the recombinant technique that they believed dangerous: the guidelines issued last summer by the government's National Institute of Health were insufficient—evidence that coupled organisms to be used in experiments could not live in the human gut was pitifully weak.  
The NAS forum was one of the largest and most controversial held for many years. The sessions were packed, and included representatives from 15 countries, scientists, philosophers and members of public interest groups.

### Oxford to go 'mixed'

Oxford University Congregation has voted 88 to 55 for a policy of no longer withholding consent to amending college statutes to allow the admission of members of either sex. This will allow the 21 single-sex undergraduate colleges to go mixed by October 1979, providing this is agreed in a postal ballot.

### 'Unrealistic' career hopes attacked

By David Walker  
Many students now on academic degree courses would be of much greater use to society if they had left school and gone straight to work, Mr Oakes, Minister of State for Higher Education, told a conference of educationists and industrialists this week.  
Such students would be happier either on polytechnic sandwich courses or working for firms that knew the value of appropriate training. Some 16-year-olds, too, would have had a better chance in life if they had avoided the sixth form and found apprenticeships.  
Mr Oakes told a meeting of the British Association for Commercial and Industrial Education in London: "We are rightly proud in this country of the tremendous expansion of education. Opportunity we have achieved in all post-16 education has increased substantially, and the numbers entering further education colleges has actually doubled in the past ten years. One of the features of the so-called good old days was that very many youngsters never got a look in when it came to developing their full potential.  
"It seems to me that we now have to take the greatest possible care not to produce the precisely opposite problem: that is, by continuing full-time education seem the norm, we may be encouraging unrealistic career aspirations among some young people, and also be actually depriving them of the practical preparation many of them need to enter the world of employment across their aptitudes and gifts."  
Mr Oakes spoke of a maze confronting the school leaver, of paths which led him to the wrong place. What was needed was "comprehensive counselling" for 16-year-olds on wages and further and higher education choices. The best possible careers guidance ought to be available from an earlier age, perhaps from 13 years.  
The theme of the conference was the state of play in the various job experience and vocational preparation schemes started in recent years. Mr Oakes emphasized the need for collaboration between education and industry and listed recent initiatives by the Department of Education: the further education curriculum review unit, the training and further education consultative group, and so on.  
In the light of such achievements, Mr Oakes criticized the "professional pessimists" in the press and media who had attacked the pilot vocational preparation scheme being run by the Training Services Agency and local education authorities. The first response of employers to the scheme demonstrated in their willingness to take young people from the work had been disappointing, he said, and the scheme could have been better arranged.  
"One of the main reasons for our poor record in day-release is the many employers are not convinced of the value of the training and further education for young workers. This calls for investigation."

### Dr Neave's university challenge

The "outmoded and value-trenched" entrance criteria of the Civil Service are a fundamental reason why so few really able young people in Britain choose a technical education, says a report published this week.  
Dr Guy Neave, senior research fellow at the European Cultural Foundation in Paris, studied the post-war development of higher education in nine European countries, with the support of the European Commission. His conclusions—written with Dr Sally Jenkinson, senior politics lecturer at the Polytechnic of North London—throw doubts on the relevance of the "great debate" to Britain's industrial performance.  
Problems which appear to be deepened radically, educational recruitment to Britain's elite occupations, dominated by the Civil Service administrative grades. The authors argue that unless these are changed radically, educational reform—whether at the school or university level—will be pointless.  
The present Civil Service entrance examination is compared as "that curious university television quiz show which allows—purportedly in accordance with the wishes of applicants to shine, but scientists, on the odd question here and there suggest impartiality, to appear as uncouth bores. If the flood of history and economics graduates kept high, it is because that is the path of educational righteousness leads to high prestige and 'reserved occupations' at the top of which is the Civil Service."  
Patterns of Inequality, by Guy Neave: NFER Publishing, Thames Avenue, Windsor, £4.50.

### Law course cut ordered

The Council for National Academic Awards has instructed the Polytechnic of Central London to suspend the intake to its BA law degree for one year from next September.  
The ruling follows the college's decision to exceed the maximum intake figures laid down by the CNA, both the years the course has been running.  
In September 1978 the intake reached 75, 15 more than the 60 maximum. At the beginning of the current academic year, 92 first-year students were enrolled, 22 in excess of the 70 polytechnic plans to have level talks with the CNA about the controversial ruling. The law school board was due to meet on Wednesday to discuss the issue and the academic council is to consider the issue today.  
A CNA spokeswoman confirmed this week that a letter had been sent to the polytechnic about the breach of law students. She said the council was concerned about the resources for the number of students.  
"A polytechnic spokesman said: "We are going to challenge the ruling. The council has agreed to us with a fait accompli but they were good reasons for doing so."  
He maintained that the demand for the course was high and new polytechnic premises would be available from next January which would ease any space problems.

### OU 'dismay' over college closure

The Open University Senate has voted in favour of a motion calling for the resignation of the vice-chancellor, to meet the Ministers of State for Education and the Environment to express the university's dismay over the Government's proposal to close Milton Keynes College of Education.  
The motion, which was passed 229 in favour and 21 against, includes the words: "It is the considered view of Senate that the closure of Milton Keynes College would be unjustifiable and that the proposal to do so could not be taken account of in the special role of this college in the developing community or the special significance of its relationship with the Open University." The college has been running a combined degree with the university since 1972.

### NEXT WEEK

Frances Yates on Isaac Newton  
Larry Grant and Adrian Taylor on Kent's law clinic  
Ernest Rudd on student fees  
Profile of Paul Ehrlich  
Reviews of new books from the university press



Francesco Lorusso, a left wing student shot dead in Bologna, allegedly by police.

### ILEA softens overseas student line

by Sue Reid  
The Inner London Education Authority has substantially shifted its stand over the controversial introduction of overseas student quotas in its five polytechnics.  
In a surprise move the authority has withdrawn threats to reduce the block grants and staff establishments of the polytechnics opposing the quota ruling.  
It also indicated that the initial level of cutbacks in overseas student numbers, to begin in September, will not now be insisted upon.  
This follows top-level meetings between the polytechnic directors and the authority, and fruitful discussions between Mr Tom Driver, general secretary of the National Association of Teachers in Further and Higher Education and Sir Ashley Bramhall, leader of the ILEA.  
In a letter to the directors this week Mr John Bevan, senior assistant education officer, said: "The exact targets for the 1977-78 session will not be insisted upon although the authority will definitely expect to see some decrease, compared with those in the current session."  
The authority was postponing a decision about any reduction in teaching staff establishments to allow further discussions to take place. There would be a review of the overseas student policy before any targets were set for the 1978-79 session.  
Mr Bevan emphasized that the authority had not formally reconsidered its policy about foreign students but the whole position would be reviewed by the ILEA, higher education and further education sub-committee.  
Last autumn the authority instructed the polytechnics to keep their overseas student numbers to the same level as the 1975-76 academic year. The standard was designed as the first phase of an ILEA plan to reduce them from 25 per cent to 10 per cent by 1982.  
The governing bodies of Thames and Central London polytechnics earlier this year rejected the reduction directive. South Bank and City polytechnics called for further talks and the North London polytechnic is due to discuss the issue later this month.

### Italy rocked by student riots over unemployment

from Patricia Clough  
ROME  
Peaceful mass protest against youth unemployment.  
But groups of youths with firearms, iron bars and petrol bombs broke away from the procession to attack the headquarters of the ruling Christian Democrat Party, ransacked two gun shops for more weapons, smashed shop windows and overturned and set fire to buses and private cars. The police, who were trying to keep the march under control without clashes which could cause victims, were repeatedly fired at and pelted with heavy granite cobbles.  
Some 20 people were injured, 14 of them policemen, many with bullet wounds. About 100 students were detained and 30 arrested, some for attempted murder.  
The Interior Minister, Signor Francesco Cossiga, issued a statement half way through the evening calling the disorders a "pre-arranged and criminal plan for urban guerrilla warfare."  
There can be no doubt that the groups had come prepared for violence: they had brought masks, pistols and knapsacks full of petrol bombs with special chemical detonators.  
The new university extremists form many groups, collectively known as the *autonomia* because of their rejection of any political label, but widely differing in style. Some, like the so-called "Metro-politan Indians" are picturesque and wear warpaint and are given continued on back page

### Lord Boyle to be CVCP chairman

Lord Boyle of Handsworth, vice-chancellor of Leeds University since 1970, has been elected chairman of the Committee of Vice-Chancellors and Principals for 1977-78. He succeeded Sir John Habakkuk, the vice-chancellor of Oxford University, in July.  
"Briefing", page 9

### Top medical schools twist DHSS's arm

by Clive Cookson  
science correspondent  
New guidelines from the Department of Health and Social Services for the distribution of funds within health regions are a major concession to the interests of medical education, it was claimed this week.  
Last year's proposals from the Government's Resources Allocation Working Party (RAWP) for redistributing health service money to deprived areas provoked an outcry from medical schools, especially in London, which claimed that the long term interests of education were being sacrificed in a dubious quest for equality.  
At a conference of the Association for the Study of Medical Education on Monday Dr Robert Lowe, dean of St George's Hospital Medical School, said the DHSS had responded to the protests by sending the regional health authorities a letter which "strikingly modified" the original proposals.  
In particular, regional university liaison committees are to discuss as part of the process of allocation the total level of resources to be made available to teaching hospitals and units. The RAWP report had recommended merely that university liaison committees should be consulted before allocating the Service Increase for Teaching (SILT)—the relatively small sum intended to protect clinical teaching facilities from the effects of redistribution.  
The DHSS letter says the Secretary of State, Mr Ganal, recognizes that in some circumstances it may be inappropriate to redistribute funds towards RAWP targets, and, exceptionally, it may be appropriate actually to increase the difference between current allocation and target.  
The need to protect centres of medical excellence and teaching facilities is spelled out at some length. Authorities are reminded that teaching units, especially in London, may need a scale of provision above that needed to support local district populations.  
"Where medical schools are expanding the increasing service needs of the teaching hospitals should be taken into account as an important claim upon available resources. And the Secretary of State accepts that funds should be available to sustain a high standard in centres where students are taught."  
A DHSS spokesman said the letter contained nothing really new. It was just a reminder to regions of the procedures they should be carrying out anyway. But North West Thames Regional Health continued on back page

### Food, glorious food is Oxford boating song

by Stephen Pile  
What travels sitting down, consumes 10,000 calories a day and is abnormally attractive to women? Most members of the Oxford boat race crew.  
Like their Cambridge counterparts, they have been in London for the past 10 days getting "psyched up" for tomorrow's race. It would be wrong to assume, however, that this involved a lot of rowing—some days as little as 17 minutes—but it does mean eating a lot of gordon blue meals, watching films in their string room and answering phone calls from lady admirers.  
"We have to keep eating," explained one oarsman from behind an unusually large slice of the chocolate cake which camouflaged the entire crew, "because we burn up a lot of energy. Winning a boat race has a lot to do with food."  
This being the case, Oxford's secret weapon is not their new boat, but Miss Celia Keyworth, their cook, who has accustomed the crew of our nation's water-borne hee-fake to go to work on taramosalata, Persian chicken and home-made chocolate profiteroles.  
The only exception is the cox, Colin Mounthall, who



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### Our dustman is learning to speak Urdu

Nelson and Colne College has launched a language course in Urdu to encourage local people to mix with the immigrant Pakistani population.

The first class attracted eight students as diverse as dustbin collector, teacher, policeman and ambulance driver. Their basic interest was practical. Work brought them in daily contact with Asians, underlining the need to communicate: the dustbin man wanted to have a few words of Urdu to help him on his rounds.

Mr David Biezado, head of the department of liberal education at the college, sees it as a philosophical response to a specific community need, apart from the educational aspects, encouraging the indigenous inhabitants to approach alien communities rather than expect them to make the first move.

The class has grown to 18, the present limit under existing conditions. An Asian studies course is in the planning stage.

Reactions from Asians has been favourable.

### Merger suggested for British Council

The report of the working group on British universities, polytechnics and overseas development, under the chairmanship of Sir Michael Swann, has now been published.

The report recommends a strengthened Inter-University Council as the best means of organizing overseas contacts in future but recognizes that a merger of the IUC and the British Council might be more politically feasible.

It is available from the Inter-University Council for Higher Education Overseas, 90/91 Tottenham Court Road, London W1P 0DT, price 40p.

Overseas continued

## WESTERN AUSTRALIAN INSTITUTE OF TECHNOLOGY

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**TENURE:** Appointment may be either tenured or non-tenured for a period of up to three years.

**APPLICATIONS:** Detailed applications, including a curriculum vitae and the names of three referees should be submitted to the Appointments Officer, Western Australian Institute of Technology, Hayman Road, South Bentley 6102, Western Australia. A brochure containing further information may be obtained from the above address. Closing date April 16, 1977.

When applying please quote reference HES.

## Oxford men may take mixed college case straight to Privy Council

If Oxford University does not soon make up its mind about co-education, the single-sex men's colleges that want to go mixed may make a direct approach to the Privy Council for approval to amend their statutes.

If they did, they would be trying to bypass the system under which the university has to approve changes to college statutes which affect the university as a whole before the Privy Council is asked for its consent.

The impatience of the men's colleges to get the question settled stems from the indecisive end to a debate in Congregation last week, when the dons voted 88 to 85 in favour of a resolution that the university should no longer withhold consent to changes in college statutes which would allow them to go mixed.

As soon as the closeness of the vote became apparent, dons opposing the resolution collected the 50 signatures necessary to requisition a postal vote which they hope can be arranged quickly and the result announced before the start of next term on April 24.

If the resolution is then defeated there would be an end to the hopes of the men's colleges wanting to go mixed that they would be able to matriculate women in October, 1979.

For procedural reasons, an alternative resolution put forward by more than 30 dons cannot be debated until April 26, but their leader, Mr John Lucas, Fellow of Merton College, implied in his speech in Congregation, there is no need for haste to go mixed; instead there should be an orderly process of change.

The alternative resolution, like the one voted on in Congregation, recognizes that the continuance of some single-sex colleges and an

orderly process of change are in the interests of Oxford as a whole. But it would have the university instruct the Conference of Colleges to "produce a scheme which will over the next five years allow some single-sex colleges to admit undergraduates of either sex", while ensuring that the interests of the women's colleges are not jeopardised; that colleges which remain single-sex are not put at a disadvantage in any new system of admissions groups; and that all reasonable steps are taken to prevent the polarization of subjects.

This resolution too, whether carried or rejected, could be made the subject of another postal vote. The debate in Congregation was remarkable for a speech by the principal of Somerville College, Mrs Barbara Craig. Speaking persuasively, she said she would prefer Somerville to stay single-sex for the time being.

It would be sad, she said, if public opinion were to bring about changes that the Sex Discrimination Act seemed to make it impossible to reverse. Many young women,

including some of the most gifted and spirited, for various reasons preferred a women's college. They worked much better and were much happier if they could immerse themselves in what they were doing without constantly comparing their progress with that of the men.

The principal added: "I expect that this is all very deplorable, but I believe it to be true of a large enough number of young women to make the existence of some women's colleges desirable, at least until social prejudices have greatly changed."

Mr Lucas urged the rejection of the resolution on the grounds that if it were accepted, it would damage Oxford by the way it would be construed.

It would be regarded as the starting pistol for a race in which the men's colleges would each try to beat all the others in grabbing the best girls for themselves. Once the situation was seen in this way, it would be self-enforcing; colleges would not feel able to hold back for fear of being put at a disadvantage.

## Ruskin begins art degree

Ruskin School of Drawing and Fine Art, at Oxford, will start a Bachelor of Fine Arts degree from next October. Opposition to establishing the new degree was defeated by 81 votes to 13 in Congregation last week.

Total intake will be 20 each year and students will be admitted as undergraduates of colleges. At present students do not have undergraduate status and can only achieve a certificate in the art.

Lord Bullock, Master of St Catherine's College, spoke in favour of launching the degree and against a proposal preventing it being estab-

lished "until such date as Congregation shall determine after considering a more precise and detailed statement of the costs of implementing it".

Opposition, mainly on financial grounds, was mounted by Mr D. L. Strickton, fellow of Brasenose College, who felt the £24,000 estimated annual cost of the degree course was too low.

Professor J. H. Burnett, former vice-chancellor of the general board of the faculties, speaking for the Hebdenham Council, said such items were not usually taken into account in proposals like this.

## Sharp rise in applications for London

Applications for several London University Colleges are up between 10 and 20 per cent above the national average of 4.5 per cent, according to the latest figures.

Undergraduate applications for Imperial College show a 16 per cent increase over this time last year and a 40 per cent increase over the year before, while those for the Mary College, a total of 8,225, up by 11 per cent.

At Chelsea College applications for undergraduate science courses are up by 20 per cent and by 10 per cent for arts subjects in applications of 14 per cent more than 12 students on average applying for each place.

The latest figures at UCL show applications have risen by just over 7 per cent to 12,000 at King's by 13 per cent to 7,152.

Each college is showing an increase in particular subjects. Queen Mary College, applications for arts subjects overall are up 21 per cent, with 40 per cent for English and history subjects. Nationally the increase is small in these subjects.

Science and engineering are up, with a 13 per cent increase overall, and particular increases in nuclear engineering (35 per cent) and in computer science (31 per cent).

At Chelsea, substantial increases are evident in biological sciences where applications are up 40 per cent, and basic medical sciences where they are up by 28 per cent. Another popular subject is geology for which applications have risen by 73 per cent.

University College has had a 67 per cent increase in applications for fine arts, partly because admissions for the course have recently been through the Universities Central Council on Admissions and a 67 per cent increase in applications for other subjects which demand a high level of English, where applications are up 20 per cent, medicine (35 per cent), civil engineering (14 per cent) and computer science (14 per cent). Subjects down on last year include chemistry and physics.

Demand at Wye College is up for agricultural economics and sciences. Applications for agriculture are up by one-third, and horticulture and agricultural economics by one-fifth.

At King's College applications continue to rise for law and engineering, and there have been small increases in applications for chemistry, mechanical and engineering, aeronautics, computer science, life sciences, petroleum engineering, metallurgy and materials technology.

Estimates based on UCCA's January figures give an expected 153,000 candidates, compared with 142,000 in October, 1976. The flow of overseas candidates has kept up last year's rate.

As it is the total number of overseas applicants could still be greater than last year, but they would represent 13 per cent of the total compared with 12 per cent last year. The analysis of applications for medicine, mechanical engineering, agriculture, business, accountancy and education, though figures for the last subject are complicated by inclusion of those applied for in other applied subjects, also in the traditional, civil and social studies: dentistry, engineering, mathematics, law, biology, chemistry, combined languages, combined science and arts, and arts.

## UCCA expects 11,000 more

The Universities Central Council on Admissions expects 11,000 more overseas applicants for university places this year than last. This is an increase of one-twelfth, but final comparisons will have to wait till the end of the year.

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## Medical intake to increase as planned

By Clive Conkson, science correspondent

The increased intake to medical schools is to go ahead towards a target of 4,100 graduates a year by the early 1980s, despite growing fears in the profession that the country will soon be producing too many doctors.

Sir Frederick Dainton, chairman of the University Grants Committee, and Professor John Reid, deputy chief medical officer at the Department of Health and Social Security, made it clear to a meeting of the Association for the Study of Medical Education (ASME) on Monday that the Government would not be panicked into cutting its expansion plans.

Last month the British Medical Association's Special Representative Meeting voted to include in its evidence to the Royal Commission on the Health Service a report by the Hospital Junior Staff Committee calling for the annual output of medical graduates to be cut to 2,820 by the end of the decade, a reduction of about 3,070, allowing for undergraduate wastage.

The junior doctors' document claims that medical unemployment is inevitable even if intake is held steady at next year's level (3,735). Cutting back would, they say, allow the NHS to become self-sufficient in doctors, will allow for a small growth in potentially employable doctors and assumes we have about as many doctors as we need now. This would also pro-

duce a saving in training costs and salaries over the next five years of about £120m.

Manpower planning was a major preoccupation at the BMA meeting, and some delegates voiced their fear of doctors on the dole in emotional terms.

The DISS was said to be deliberately aiming for an oversupply so that it would get doctors' services more cheaply, and the UGC was accused of unwillingness to take a long term view because a reduction in medical school numbers would mean a fall in UGC income.

However some speakers cast doubt on the validity of the statistics the juniors used to produce their figure of 2,820 graduates a year revised upwards from 2,600 just before the meeting.

Figures Sir Frederick gave the ASME conference at the Royal College of Physicians showed that detailed planning extends to a medical school intake of 3,921 in 1979. The 4,100 target would be reached "by the early 1980s".

Professor Reid said the Government still attached "high priority" to achieving this target and did not feel it should be reduced in the light of present knowledge. But he agreed that a mechanism for keeping medical manpower under continual review was needed — the BMA is demanding an independent manpower review body to make annual recommendations on intake.

Sir Frederick said the UGC, in liaison with the DISS, was keeping a close watch on the availability of pre-registration posts for newly graduated medical students—there give the year's hospital experience needed before registration with the General Medical Council, and there have been fears that soon there will not be enough houses just to go round.

Professor Reid said the position was quite secure for the next three years. A working party was looking at the long-term future, but there was no question of medical graduates being unable to qualify because they could not get a pre-registration job.

Sir John Broderick of the Scottish Home and Health Department told the meeting that 1977 would be a critical year in Scotland, because two years were graduating together from Glasgow University Faculty of Medicine following a reduction in the length of the course. But there was confidence that the health service could absorb more pre-registration posts than had been forecast.

Sir John did not believe Britain was producing too many doctors—though it would soon appear to be unless the health service career structure was reformed. This reflected a major concern of the ASME conference. Medical educationists are just as worried about the deficiencies of the health service career structure as full-time hospital doctors.

## Government may have secret plan to cut numbers, v-c says

by Frances Gibb

The Government may have a secret policy to reduce numbers entering higher education, Dr G. M. Burnett, principal and vice-chancellor of Heriot-Watt University, says in his annual report for 1975/76.

The reasoning behind the fee increases was to say the deans, he writes. "Is there, for example, an unstated policy to reduce the number of young people entering higher education? Is there a move to reduce the postgraduate complement both on advanced courses and research? Is there a desire to reduce the unit costs in universities still further than has been happening for some time?"

The Government had taken little heed of the "excellent and thoughtful" report on fees by the vice-chancellors. The large undergraduate and postgraduate fee increases, and the retention of the home/overseas differential ran counter to the

proposals of the universities themselves.

The new levels would cause hardship and there could be a marked decrease in postgraduate activity, he writes.

Heriot-Watt would suffer because it always had a relatively high fee income. For example, in 1977/78 it could have 33 per cent of its income from fees. He therefore questions whether the university's recurrent grant was too low.

"What is certain is that while we have something over 1 per cent of United Kingdom students, we receive less than 1 per cent of the national cake and we are also heavily technological."

Commenting on university salaries, Dr Burnett says that university staff are 20 per cent worse off than those in comparable employment. This was an enforced university economy which was saving the Government between £50m and £60m a year.

## Support for overseas quota

A quota system for both home and overseas postgraduates would be much more acceptable than high fees which deter them, Dr Clifford Butler, vice-chancellor of Loughborough University, writes in his annual report for 1975/76.

If Loughborough implemented the new fee levels, it would lose half its 405 self-financed postgraduates and a small proportion of the rest, he says. Self-financed postgraduates form 37 per cent of the total 1,097.

He warns also that although the university managed to save some £1m over the year it might soon

be necessary to abolish some posts when they fell vacant, and it might not be possible to maintain libraries and laboratories adequately.

The university would also find it difficult to maintain the level of its research activity during the next few years. The total value of its Science Research Council grants at the end of March last year was £889,000 compared with £1,050m the year before.

On the future development of the university, he says it had revised its student target of 6,000 students by 1981 to 5,200, and even that might be unrealistic in view of public expenditure cuts.

## 'Apathy hits translation'

Academics' apathy is one cause of the present poor standard of translation, according to Professor G. P. Butler, professor of modern languages at Bath University.

In a public lecture this week he urged academics to act as a pressure group. They might not make the best translators, lacking, perhaps, flair or inclination, but they were potentially the best watchdogs and could more than any other group say with authority that a translation was good.

There had been some excellent criticisms of translations by individuals, some non-academics, but if they did not get together and put up a united public front, their criticisms would go unheeded.

He also blamed the poor pay given by publishers to translators for the present low standards. At present material incentive to translate literature well is provided almost entirely by publishers. If the present payments represented a maxi-

mum, then effort must be made to obtain the money from other sources.

"The plight of the gifted, conscientious but impatient translator who has no real choice but to work speed could then at least be alleviated", Professor Butler says.

There would still be the problem of pressure from publishers wanting to cash in on foreign bestsellers, he said. But the effects of translators' squint—one eye on the clock, the other on a pile of unpaid bills—would be remedied.

Publishers were also at fault for employing poor linguists, he said. What was not clear was the extent to which publishers themselves tampered with their translators' work and made it worse.

To what extent, for example, are publishers rather than translators to blame for the frequent cuts in books which the unsuspecting public assumes are translations in full?



Students in Lancaster University's department of English language and medieval literature staging an evening of medieval drama last week. They traced the development of Easter liturgical drama from the tenth century to the later middle ages, and culminated in this performance on a medieval pageant wagon of one of the York mystery plays—the carpenters' play of the resurrection.

## Fewer resources force up academics' workload

Academic staff are increasingly doing more work because of scarcity of resources, Dr Ted Edwards, vice-chancellor of Bradford University, says in his annual report for 1975/76.

The workload embraced not only teaching and research, but other functions such as administration, the expansion of the number of students in the university, or an equivalent period for this sandwich courses, should be regarded as a diagnostic period, it had been agreed.

Where a student was not likely to graduate, it should be evident by the end of the first academic year. Within that year the students should be given every possible help to maximize their potential", he said. "The crucial period for many would be the first three weeks."

Several new sandwich courses had been introduced, including manufacturing systems engineering, medical sciences, science and society, archaeological sciences, public and social policy and peace studies. There were also plans for a course in manufacturing systems engineering with psychology.

## Universities 'mislead on sandwich courses'

Many universities mislead students into applying for sandwich courses by making them out to be integrated, when it is generally acknowledged that there is little connection between the work and study parts.

This is claimed in a paper to be presented next month at a meeting of the National Institute for Careers Education and Counselling, by Professor A. G. Smithers, of Manchester University's education department. He says the claim is also given extra force by the fact that educationalists agree that sandwich courses provide, at best, complementary parallel experiences.

"This is in spite of the fact that the main justification for them has always been that they are integrated courses and the claim is rarely repeated in the prospectuses of the technological universities and polytechnics."

Admitting the truth would not only "avoid some of the disappointment associated with the first periods of industrial training", but also give extra flexibility in course planning. The length and content of the training element could then be looked at to some extent independently of the academic part.

Professor Smithers does not think sandwich courses have quite lived up to expectations and he does not believe more integration could be achieved in practice "given the different aims and values of industry and universities/polytechnics".

Alteration of work and study is not in itself a good thing, he says. Even the Russians and Chinese have abandoned this as ideology. Any evaluation must take into account what work experience, what study experience. Simply to send a student away from college for half the year does not add up to an educational principle.

"Where the higher education course is directly related to some area of practical expertise as in medicine, teaching and engineering, then clearly it is desirable that students should have some systematic introduction to the application of that expertise. But the different experiences do not have to be equal in length or intensity."

Existing sandwich courses should not actually be curtailed, at least in applied fields. "But I can see no educational grounds for over-turning established courses at places like Imperial College, UMIST and Cambridge." I wonder if the advocates of extending the sandwich system are really more concerned with extrinsic matters like the control of the curriculum than the intrinsic problems of educating creative engineers.

## Professor rebukes SNP critics

Scottish Nationalists critical of the number of English lecturers in Scotland's universities were rebuked this week by a senior professor at Edinburgh University who is also a prospective SNP Parliamentary candidate.

In a letter to *The Scotsman* Professor Neil MacCormick, brother of an SNP MP, deplored "anti-English expatriation". "They are offensive to the sense of decency and hospitality which most Scots people feel and as such they are harmful to the SNP. They have, so far as I am aware, nothing to do with any official position of the party."

He said the Scottish universities had to remain at the apex of Scottish intellectual and scholarly life, but the question was what they were and their staff did not where they were born.

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Social scientists offer skills to industry

by David Walker
The Social Science Research Council has launched a scheme to put social science expertise at the disposal of industrial and commercial firms, public bodies and trade unions. The experiment, entitled "Open Door", is a new departure which shows the direction the SSRC has begun to take in recent months. Much of the impetus behind the council's move to put social science to greater public use has come from its chairman, Mr Derek Robinson, former deputy chairman of the Pay Board. He is excited about Open Door's possibilities of stimulating "genuine and high quality academic research that is relevant".

Now chemical engineers opt for agriculture

by Clive Cookson
Agriculture is a classic multi-disciplinary area, encompassing most of the biological and physical sciences and many branches of engineering. Chemical engineers, however, have not been significantly involved so far, although many agricultural processes are similar in principle to the industrial processes with which they are traditionally concerned. Closer links will be established between the chemical engineering and agricultural professions over the next three years with an £83,000 grant from the Wolfson Foundation. It will pay for a research programme at three universities, co-ordinated by the Institution of Chemical Engineers.

Hope springs geothermal in Bath scientific test



Britain's best known hot springs, at Bath, are being investigated by chemists from Bath University, as a possible source of useful energy. They are included in a £60,000 study of the United Kingdom's geothermal energy prospects, financed by the EEC and the Department of Energy and administered by the Natural Environment Research Council. Research teams at Oxford, Imperial College, London, Harwell and the Institute of Geological Sciences are also involved. The Bath group, directed by Dr John Andrews of the school of chemical sciences, will study the hot springs at Hotwells, Bristol, as well as the more famous ones on their own doorstep. They will also investigate water flowing out of the granite in Cornwall and perhaps water sources in the Hampshire basin. They will use radiochemical analysis to measure the quantities of radioactive elements (radon, uranium and thorium) in the water. The amount of these gases (argon, helium and radon) will be determined too. This analysis, together with being done at the Institute of Geological Sciences, will give an accurate picture of the water's temperature and its depth. The amount of radon in the water has been measured in the past, but the yield of hot water is expected in the future. The question we hope to answer is whether we will be able to turn geothermal energy into other natural resources like coal and oil. Dr Andrews says he has already discovered 100,000 years in Bath and Bristol.

Travelling men to help project

Some 12,000 businessmen who travel by air or rail between London and the North-East are to take part in a Newcastle University telecommunications research project. Entitled "The Impact of New Telecommunications Technology", it is being conducted by the university's regional development studies research group under the direction of Dr John Goddard, professor of regional development studies. They are hoping to find out the role communications play in regional developments, especially in business and service industries. Professor Goddard said: "Improvements in road transport over the past 15 years have meant that most industrialists in areas like the North-East are no longer at a serious disadvantage in terms of the cost and convenience of moving goods. However, for businessmen who have to keep in close contact with their customers and suppliers based in London and the south-east, a peripheral location can involve extensive travel and long absences from the office. This can result in delays in dealing with pressing internal matters or in lost opportunities." By examining business communications and thereby assessing the information needs of industry and commerce in the North-East, the study hopes to show how investment in telecommunications might be related to other regional policies.

Grant dilemma may delay complete Lawrence letters

Publication of the first complete edition of D. H. Lawrence's letters will be delayed significantly by at least one person on college staff. Yet the college has to make rules and the person who tries to apply them will spend a lot of his time resolving special cases put up by his colleagues. Part of the answer is, of course, only to accept students who can show firm evidence of financial support before they register; but it is difficult to be completely sure that any form of support, apart from a grant, will last for three years. But can the head of my department really tell me not to talk to someone? Even at home? One of my colleagues suggested that it would be alright to talk to anyone, including my own registered post-graduate student, since in doing this I would be defrauding my employer of the income from my services. I am afraid that if it came to this improbable point I would not be a loyal employee. We do not have an



D. H. Lawrence.

Civil engineers will study road use

Civil engineers in the transport studies group at University College London have recently been given extensive grants to examine various aspects of road traffic. The Department of the Environment transport and road research laboratories have awarded nearly £25,000 to Professor R. E. Allsup. The money will be split into studies of how traffic volume affects how people use roads and into an analysis of road accident injuries. The Science Research Council has awarded £12,500 to Mr J. G. Wardrop for research on junctions and two-way roads.

Don's diary

Rule change

Some new doddish dilemmas emerged in coffee-time conversation the other day. With the increase in fees, it matters to the student much more now whether a student is full-time or part-time. Two years of full-time registration is required to qualify for a PhD, but most students have not completed their project within two years, so students whose fees are not paid from a grant have been allowed to continue for a third year paying only the part-time fee. This rule has just been changed. Now they will have to pay the full fee for the third year, unless they can prove that they are in regular salaried employment. Fourth and subsequent years will still be allowed on the part-time fee. One of my colleagues has a student who cannot afford the new full-time fee for his third year. What should the student do? "He should not register," says one, "if he has paid two years' fees, he can finish his work in a registered, and submit his thesis when it is ready." "Alright," says a college administrator for postgraduates, "but what about supervision?" "Well, all this has needs is a chat once a month and access to the library." "But how is that different from many other postgraduates who are paying the full fee? Are you, as an employee of the college, entitled to talk to him about his project, and to allow him to use the library if no fee has been paid?" This remark put the administrator into a minority of one. Not one of us would deny a student our time if he had already begun a piece of work with us, even though we might not be able to do anything about the library if the college decided to keep him out. The administrator was not surprised and he went on to demonstrate the division of loyalties that there can be between care for individual students and responsibility to the institution. If this student is unregistered he is not counted in our University Grants Committee return, so the college loses a capitation fee as well as his personal fee. Almost every postgraduate student once he has started a project, will be defrauded financially by at least one person on college staff. Yet the college has to make rules and the person who tries to apply them will spend a lot of his time resolving special cases put up by his colleagues. Part of the answer is, of course, only to accept students who can show firm evidence of financial support before they register; but it is difficult to be completely sure that any form of support, apart from a grant, will last for three years. But can the head of my department really tell me not to talk to someone? Even at home? One of my colleagues suggested that it would be alright to talk to anyone, including my own registered post-graduate student, since in doing this I would be defrauding my employer of the income from my services. I am afraid that if it came to this improbable point I would not be a loyal employee. We do not have an



Lord Rutherford

equivalent to the Hippocratic oath, but surely our responsibility to our discipline is more important in the end than our responsibility to the college. I hope and suspect that the real test for most of us would be whether the student had paid his fee, but whether his work was any good.

Slow research

Recalling from the cashdesk, 70p poorer, with a grey pie swimming in gravy, some soggy chips and a hazelnut yogurt on my tray, I cast my eye around the evening eaters, scattered sparsely through our gloomy lower refectory. No colleagues here tonight, no chamber-music people, but there are a few physics second-years. That will not be embarrassed if I sit next to them. In fact they even keep up their own topic of conversation, instead of instantly deferring to the lecturer in their midst. After a while they drift around to one of my hobbyhorses and I join in. Why do people attack "big science"? Does it take such a large amount of money? As we tackle the standard arguments one of them suddenly becomes devil's advocate. "You cannot compare the Science Research Council with the Arts Council. Even the elite arts like

opera and ballet are enjoyed by millions of people, but there are only a few hundred of you high-energy physicists who copy think-ing about quarks. You all never persuade the anti-science people with that argument." So I suggest that particle physics has made real progress lately. All the big ideas of the last 20 years are opening up. We are not just finding new particles, we are finding simpler basic theories, and that could lead to applications. This is the worst possible time to cut the funding.

I have heard that before. For such abstract research as yours it would take 50 years for any application to emerge. You've been claiming great breakthroughs ever since the war. What about all that particle nonsense in 1977? That was supposed to be the 'key to the universe'. Now, 20 years later, you say you are just beginning to see why physics is violated. I don't think that things have gone slowly for a while, but it is impossible to predict the outcome of research. Maxwell had no idea that his obscure equations would lay the basis for the communication industry. Even as late as the early 1930s, Rutherford strenuously denied that nuclear science could have any significant early application. What we have is a long-term equilibrium between fundamental research and practical applications. If you cut off the former there will be no immediate consequences, but in 30 years it will make a big difference. "That is just the kind of sophisticated argument that scientists always put on. But you have to realize that these critics do not understand complicated things like 'long-term equilibria'. It is not good enough. If there is no short-term pay-off, then how can you expect the millions to flow?" I count this for myself as a tactical victory. But I know that the student I am talking to wanted me to win all along. He is probably worried about whether there is a place for him in pure science in the next few years.

Sleeping code

Do other people have personal rules about sleeping in lectures? My own code would be as follows: never sleep in a research colloquium when I personally invited or introduced the speaker; never sleep in the front row; never snore; never wake up a sleeping colleague. I cannot remember ever having broken these rules, though I do count sleeping in seminars as one of the pleasures of life. If sleep wants to come then it should not be fought. Less time will be lost if you give up immediately. I can claim to have asked some of my best end-of-colloquium questions after a 10-minute snooze during the first half-hour. My only embarrassment came once when I was sitting in the back row, listening to a friend talk about something much too difficult for me to understand, with a large audience in which I was one of his few acquaintances. As I nodded off he saw me and he thought that I had seen a flaw in his argument. He stopped immediately and asked me what was wrong. Dragging myself back to consciousness I amazed myself by saying, without a moment's delay, "It's all right, I've just seen your point. Please go on."

A few minutes later I broke out into a cold sweat as I realized how awkward it could have been if the right words had not appeared on my tongue. Sleepers in the audience for my own talks do not worry me much. Some may even be quite entertaining. There was a senior physicist in one of the SRC laboratories who lolled his head and hung his jaw in a most uninhibited way. Even when he sat at the back you could rely on knowing when he dropped off, and it was even easier to tell when he came to and tried to assume the air of one who has been listening all along. The other week, however, I was a little put out when I had to lecture to a class of only three, one of whom, sitting behind the other two, went to sleep for his special case I would suggest another rule: never sleep unless I am sure that someone else in the audience is awake.

David Miller
The author is lecturer in the department of physics and astronomy at University College, London.

My country right or left



Martin Trow

The popular view of what has been happening on American campuses in recent years might be summarized this way: for a period of seven or eight years in the 1960s and early 1970s, starting out in Berkeley in 1964, there was widespread turbulence and disruption directed both at the forms of education on campus, and changes in American policy overseas, especially aimed at ending our military involvement in Vietnam.

This broad movement, so this picture goes, was marked by a political swing to the left among college and university teachers and students. With the end of the draft and direct American participation in the war in Vietnam, the climate on campus changed sharply: it became less political, more conservative, and centred more on teaching and study. In addition, in the face of the sharp economic recession of 1975, the mood on campus became rather more sober and serious. The students became increasingly anxious about the dangers of unemployment after earning their degrees, and therefore they began to enrol in increasing numbers in courses and fields that could promise some assurance of their getting jobs on graduation.

This "new vocationalism" of college students, so this picture goes, was at marked variance with the bold experimentation of the generation of the late 1960s, which had centred its interest on higher educational reform and innovation. We now have the results of two large national surveys of college and university students and teachers, one done in 1969 and the other in 1975, the first sponsored by the Carnegie Commission on Higher Education, the second by the Carnegie Council on Policy Studies, both headed by Clark Kerr. The evidence that has come out of these surveys is that the popular picture of what has been happening in American colleges and universities has some truth in it, but that the reality is a good deal more complicated.

It appears that on the whole there was less change in opinion on American campuses between the late 1960s and middle 1970s than many people and the mass media believed, that teachers and students were probably less radical and discontented (except about Vietnam) in the 1960s, and probably less conservative today, than is believed. I suggested last time that comments on the political life of the United States that has shown greater turbulence and swings of opinion and sentiment than the years between 1969 and 1975. And samples of students and teachers in American colleges and universities show a remarkable stability in their

"How would you characterize yourself politically at the present time?" (per cent.)

Table with 5 columns: Undergraduates (1969, 1975), Graduates (1969, 1975), College & Univ. Teachers (1969, 1975). Rows include Left, Liberal, Middle-of-the-road, Moderately conservative, Strongly conservative.

basic political identifications over that period of time. When we asked students and faculty members "How would you characterize yourself politically at the present time?" and offered them a five-point scale from "Left" to "strongly conservative" along which they could locate themselves, the different groups showed very similar distributions. Even in 1969, at nearly the height of the disturbances on campus, no more than one in 20 undergraduates, graduate students or teachers called themselves "left", and the proportion was no higher in 1975.

In 1969 about two out of five in all three samples called themselves "liberal", about one in six undergraduates and one in four graduates and teachers called themselves "moderately conservative", only 3 or 4 per cent called themselves "strongly conservative" and the rest, between a quarter and a third of the graduate students and teachers, and nearly two-fifths of the undergraduates, called themselves "middle of the road".

The distributions of political self-identification shown in the table remind us first that the politics of American academics and students, even during the height of the disturbances against Vietnam, were still very moderate: in 1969 as in 1975 over 90 per cent of all three groups were in the middle three political categories.

Second, the data show a quite remarkable stability over the six years between 1969 and 1975. The undergraduates show a slight shift from the liberal to the moderate conservative category, but the graduate students and college and university teachers show no significant trends at all, given the reliability of these kinds of data.

And third, there is a remarkable similarity in the distributions among these three groups. The graduate students and the teachers are very close at both times; the undergraduates differ not in being more or less conservative than the other two groups, but in their somewhat larger proportion who see themselves as "middle of the road" perhaps not surprising for a very large group which is on the whole both younger and less politically committed than the others.

For comparison, the Halsey/Trow survey of British academics in 1964 gave British university teachers a chance to locate themselves on a similar scale with somewhat different labels: far left, moderate left, centre, moderate right and far right. The distributions along that scale were not very different from the American findings five and 11 years later: only one in 20 in the far left category, nearly half in the moderate left, a little over a quarter in the centre, about one in five in the moderate right and only 1 per cent who identified themselves as far right. This almost exactly matches the distribution (in the five American categories) among teachers in the leading American research universities which British universities closely resemble in other respects as well.

I suggested in my last column that many observers tended to over-interpret the events of the late 1960s in American higher education. I think the events themselves—the demonstrations, strikes, sit-ins, and so on—had little consequences for the institutions in which they occurred. They also had a major impact on national politics: for example, I think that the anti-war movement based on college and university campuses was largely responsible for President Johnson's decision not to run for reelection in 1968. (It is much more debatable whether the anti-war movement hastened or slowed America's withdrawal from Vietnam.)

But there is a tendency for such large and amorphous events to become a kind of Rorschach "ink-blot" which each observer can interpret in support of his own theories. I suggested last time that comments on the political life of the United States that has shown greater turbulence and swings of opinion and sentiment than the years between 1969 and 1975. And samples of students and teachers in American colleges and universities show a remarkable stability in their







# Personal way to read your textbook

by Roger Broadhurst

It is generally accepted that there is considerable scope for the use of microfilm, and particularly microfiche, in higher education beyond their basic library functions of space saving and for making available rare or out-of-date material.

Among possible future applications is the use of microfiche for the supply of personal copies of recommended reading material and possibly certain textbooks to students. Investigations have already demonstrated some of the benefits of such a system although it is quite clear that much will depend on the right type of portable microfiche reader.

It is expected that an increasing number of educational applications will take advantage of microfiche and that the quest for a cheap and portable microfiche reader suitable for personal use in the home or at the place of study will intensify.

A fairly superficial survey of

existing microfilm equipment will show that microfiche readers are already in abundant supply. However, most of these machines are designed for semi-permanent installation although they are usually compact enough to be moved when necessary.

There are few truly portable machines but in the last couple of years several interesting new models have emerged which go some way to meeting existing needs. Whether the ideal one will emerge is debatable as the requirements are quite stringent and tend to be mutually incompatible.

A personal reader should not be totally dependent on mains electricity. At the moment, of course, however, are the only alternative power supply and although some readers have a 12V dc input, no enable them to operate from a car battery, it is not normally possible to equip a portable reader with its own batteries without a significant increase in size or weight. To produce a very compact reader having a high standard of optical performance and at a low cost is extremely difficult although it is encouraging to see that designers have not abandoned the challenge.

At present there are no portable microfiche readers (excluding hand-held viewers) costing less than £50 and in view of the current economic situation it is likely that this will continue to be the case. Of those available the Fuji RFP2 now costing £55 is still one of the cheapest and might fairly be described as the best in the £50-£100 category.

It is simple to use, occupies very little desk space and is easily portable although performance is somewhat limited by its maximum magnification of only 17 times (desk projection) and a relatively low level of screen luminance. Despite these limitations it represents an acceptable compromise between cost and performance.

Perhaps the only contender in this price band is the Realist Viking, also at £65. This folds away to approximately half the size of the Fuji and in terms of compactness and portability is unmatched. Despite its ingenious design, however, the Viking is difficult to set up and use and has a screen size which is far too small for most applications.

In the £100 to £150 category the Microdot Lensman Mk IV at £125 is a portable reader which has already proved of value to educators and is perhaps a little too large to be classified as a personal reader but nevertheless is fairly portable and, like the Fuji, projects an image down on to a screen in the plane of the table; a configuration which generally proves acceptable to most users when note-taking is involved. The image is bigger and brighter than the Fuji's although this is offset to some extent by the larger desk area the reader occupies. The Lensman's fiche carriage is notably greater control over fiche movement.

A more recent addition to the ranks of portable microfiche readers is the Saul Compact, a German machine costing £148 in its single lens version. It is approximately the same size and shape as a large transistor radio and has an integral rear-projection screen. It is extremely versatile in that it can be operated in a variety of positions and can easily be carried, but has a rather disappointing level of performance.

Screen luminance, essential to image quality, is too low for most situations in which the reader is likely to be used and the fiche carriage is not as easy to use as the Realist Viking, with its remote control

facility, is not easy to control accurately. It is unfortunate that what is really a quite sophisticated piece of equipment does not have a higher level of performance.

In the £150-£200 category there are two essentially similar machines available, the Bell Forman and the new Bell & Howell portable. Both machines are of the briefcase configuration and project an image on to the inside of the briefcase.

The information costs between £160 and £175, depending on the model, and in general perform very well. It has a satisfactory level of screen luminance when viewed from the optimum position and has an extremely accurate focusing mechanism permitting accurate placement of the screen image. Its only real disadvantage as far as use in education is concerned is its high price and so, like the Bell & Howell, the Forman's £187 is perhaps more suited to the executive than the student.

The equipment is available from the following suppliers: Oxford Microdot Publications Ltd, Blue Boat Street, Oxford OX1 4EY; Realist Viking and Bell & Howell from Microdot Ltd, 293 Cowley Road, Oxford OX4 2JF; Lensman Mk IV from Microdot Ltd, Merit House, Edgeware Road, Colindale London NW9 1EX; Saul Compact from Play Microfilm Co Ltd, Fulham Road, P.O. Box 68, Amersham, Bucks HP19 1LL; Bell & Howell Portable from Bell & Howell, Watlington Road, Ashford, Middlesex TW15 2L.

## Pitfalls in the teaching role of television

What is the role of television in sixth-form and undergraduate teaching over the next few years? Will it take a central place in the learning system alongside the book and the lecture or will it be limited to stimulating a general interest in a subject and illustrating principles learnt elsewhere?

Two videotapes 'Fluids and Structures in Engineering Parts 1 and 2' made by the department of aeronautics, Imperial College and the University of London Audio-Visual Centre show some of the possibilities and one or two of the pitfalls.

The programmes introduce some basic principles of fluid dynamics and structural mechanics and demonstrate how they help to explain a number of phenomena encountered in the study of engineering. Most of the examples are taken from the field of aeronautics and are covered in a more specialized way than the title suggests.

After a general introduction the first programme moves rapidly to the study of fluid motion. Methods of flow visualization and pressure measurement are shown together with examples of wind tunnel and full-scale testing of aircraft and ground structures. The programme culminates in a discussion of aeroelasticity and aircraft flutter.

There are film sequences showing the oscillations of bridge structures and a dramatic example of wing flutter in a full-size glider in flight. The effects of wing sweepback, airfoil flutter and mass balancing using simple but effective laboratory demonstrations are also discussed.

The second programme is longer and contains three distinct parts. The first section deals with the bending and torsion of straight bars and shows an unexpected way in which stiffness depends on the cross-sectional geometry.

The middle section is concerned with hydraulic flows and sluice gates, hydraulic jumps, bow waves, critical flow and the hydraulic jump, and includes a practical demonstration of each concept as it is introduced.

The last part discusses aircraft stability. A brief explanation of lift, drag and centre of pressure is followed by a series of shots of a model glider showing how static and dynamic stabilities are affected by the configuration of wing, fin and tailplane.

The order of presentation is a little puzzling. It would seem more logical to place the first programme, which links fluids and structures, at the end; and the material given in the second programme would be more easily assimilated if it were divided into three separate programmes. There are obvious points at which the breaks could be made.

Television presentation is still a new activity for many university lecturers but those involved in these programmes have achieved a reasonable balance of informality and rigour. However, inconsistencies do arise; some of the presenters have confined themselves to qualitative descriptions, others have introduced mathematical formulae.

The quality and style of production is variable. The first programme opens with a shot of aircraft landing—so beloved by television documentary producers—and, in the first few minutes, there are pictures of Stonehenge and the now familiar sequence of the Tacoma bridge collapse.

There are some good examples in the programmes of how television can illustrate scientific and engineering concepts. Its ability to enlarge, to show dynamic phenomena, to arrest movement and to run through a sequence of tests in a few minutes is used to good effect. Torsional stiffness, for example, is demonstrated by its effect on vibrations of a bar. The same is done with the occasional 'out-of-focus' lapse, but the lighting is sometimes inadequate. The demonstration of glider stability in the second programme is spoiled by being filmed in a far too small space—the models disappearing behind the desks.



Smoke flow past two cylinders illustrates fluid motion.

The videotapes are intended for sixth formers with an interest in engineering, and with good tutorial support, they will certainly provide a stimulating introduction to some aspects of engineering. First-year engineering undergraduates will also be interested in seeing the application of scientific principles to some of the more dramatic phenomena encountered in engineering. However, the programmes will be regarded by many as enrichment, rather than direct teaching, material, and this raises again the fundamental question of the beginning of this review.

Television has now established itself as one of several audio-visual aids. Will it be able to move to a central role in the presentation of syllabus material—not usurping the teacher but freeing him to play a different and perhaps more important, role in the teaching/learning system?

S. A. Urry

The author is head of the department of building technology, Brunel University.

Details and prices of the programmes are available from the Secretary, London Audio Visual Centre, 11 Bedford Square, London WC1. The booklet giving practical details of the demonstrations, is available from the department of aeronautics at Imperial College.

## How to survive when thrown back on your own resources

For colleges and polytechnics the most important single consequence of the cuts in education spending will be to throw them back on their own resources and to encourage the development of in-house in-service staff development activities.

The polytechnics have already made considerable progress in defining some of the important issues to be considered under the guidance of the Staffing Conference on Educational Services in Polytechnics (SCEDSIT) and through the network of central and regional links, collaborative development and the exchange of materials, information and advice have been established.

An example of this activity can be seen in the 'Trypsis', a reasonably self-contained teaching (learning) package for use, for example, in induction and in-service training courses. The system encourages the exchange of materials used in staff development programmes, and enables these materials to be shared with interested individuals with enough information about procedure for the unit to be replicated in another polytechnic, suitably tailored to meet the local situation.

As a further example, the second year of a proposed post-graduate certificate in education for PE teachers, presently awaiting CNNA validation at Bristol Polytechnic, will consist of theme-based study in which the main emphasis will be on the course members (all of whom will

be employed as teachers in further education) studying at home, more or less on their own but with consultation with college-based advisors as an optional extra.

The advantage of this approach is that these themes will be permanently available on open access on the library shelves so that other colleagues can browse through the materials at will in the same way that a considerable amount of saved dropping of Open University radio and television programmes takes place.

Harding and Sayer (*University Quarterly*, Summer 1975) have indicated that success needs to be a change of perception from the staff development programme as a remedial activity to the programme as a positive force in university education, and the same model of pleasure for the further and higher education sector if we care to take up the challenge it offers.

Formal courses have not proved valuable in bringing about the kind of attitude and behavioural change that the developing relationship between the teacher and the learner in further and higher education would seem to require. Some courses are too general, too long and too insensitive to the immediate requirements and sensibilities of the individual teacher.

Trevor Habeshaw

The author is in the Centre for Educational Services, Bristol Polytechnic, and a member of the Committee of SCEDSIT.

## Video for absolute beginners

There has long been a need for a first-rate manual on the use of video tape aimed at the non-technical beginner. *Using Videotape* by T. P. Robinson and P. H. Beard (£2.75) falls into just that category.

Following the format set by the previous Focal Press Media manuals of having each page of text faced by a page of illustrations, the book covers virtually every aspect of the subject, that a beginner would need to know in order to make reasonable use of the medium of videotape recordings. And in explaining it does much to clear away the mystique and explain the jargon.

Both authors are long-standing members of the television engineering profession and the text is therefore largely faultless but unfortunately not completely so.

The section on cleaning and degreasing makes mention of solvent-type cleaners which, it claims, will do some types of video tape machines there is a fair degree of risk to the video head assembly

from their use. This might lead the user of, say, a Philips VCR using a powerful solvent cleaner, such as Xylene mentioned, to dissolve the adhesive used to mount the video heads on the rotating head disc, with disastrous results.

Furthermore, the explanation of the so-called 'EIAJ' format given under the heading 'Standards and Compatibility' is an extreme oversimplification and could lead to endless confusion because as used in Europe (including the EIAJ standard of videorecording) are not only partially compatible.

Other minor criticisms of the book must include some of the rather strange, not to say impossible, versions of the illustrations which were otherwise excellent, although a little too profuse in some places.

Colin Gamman

The author is at the University of London Audio Visual Centre.



## British year book 'first' in 63 parts

This is the first time that a publication like the *Video Year Book* has been produced in Britain. According to the publishers the aim was to produce a comprehensive directory covering manufacturers and their production facilities and suppliers of systems and equipment for sale or hire.

The book is divided into 63 sections and those dealing with equipment, for example, camera mounts, lenses, rest equipment in alphabetical order with the various items produced by them described in some detail. On the whole the information provided on what equipment in each category is available and who manufactures it, is comprehensive and would be just as useful to the professional in the video field as to the newcomer. None of us can individually keep up with the whole marker and inevitably many of our own catalogues are out of date.

Some of the sections have very useful introductions to them notably in new product areas or where rapid changes in the technology are taking place. In particular the sections on discs, video, projectors, TV, prompters, TV, teletext and videotext, video tape recorders, broadcast and VTRs; industrial reel-to-reel all have very useful background information in them.

The weakest sections were those on distribution systems: RF and HF (where a number of well-known firms were omitted) and Modulators (again several firms omitted, but these are very minor criticisms, when compared with the 40 or so excellent sections).

The sections on services offered include film recording, colour, production companies (followed by details of production facilities: broadcast and production facilities: industrial), retailers, dealers and hirers of video equipment (presented under geographical areas), software suppliers and libraries, contractors (with supply systems) and video tape duplication facilities. They seemed fairly comprehensive although in the details of services offered by retailers there were some obvious omissions.

There were some unexpected sections which were a pleasant discovery, such as the brief summary of camera tube types, the listing of international TV standards, the list of basic facilities at the Television Broadcasting Studios in the UK, and the section on television training (which unfortunately is by no means complete).

Unexpected, too, but not terribly relevant except to broadcasters (but no doubt included for completeness) were the sections on transmitters (no mention of licensing problems) and the section rather misleadingly entitled 'links': video which I expected would deal with DAs and equalizers for cable systems but in fact largely dealt with microwave links although there were some interesting and unusual items in it, such as optical links and slow-scan systems.

Looking at the publication as a whole I feel that Angus Robertson and *Video and Audio Visual Review* should be congratulated on producing such an excellent book. It must have been a tremendous task collecting the information and it was very satisfying to find so few errors and omissions. I thoroughly recommend it to anyone selling, buying, or using video equipment or services and at the price it is extremely good value.

*Video Year Book 1977*, published by Dolphin Press, £4.75.

Peter Whitaker

The author is director of the television unit at the University of Birmingham.

## Films, cassettes and the Pru's complete history

A new low voltage overhead projector, the Portacube LV A4, is seen by International Tutor Machines of Ashford, Middlesex, as the ultimate in OHP design. The model includes all the usual features of the Portacube range, but has been designed for educational, commercial and industrial organizations where A4 paper size is accepted as standard. IJM claim that the projector has high image definition, precise lamp adjustment over the entire range of projection distances, and noise level is minimized by the inclusion of a turbine fan.



James Hill directs 'The Pru'.

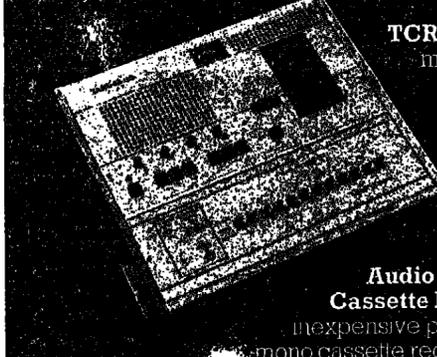
'Development and Land Tax' is a new title in a series of cassettes on taxation and accountancy topics produced by the Training Division of the Association of Certified Accountants, 22 Bedford Square, London WC1B 3HS (price £3.40 inclusive of VAT and postage, or £4 if sent overseas airmail). The speakers, who are both taxation specialists with Stoy and Hayward & Co, review the scope and operation of a tax which will have a considerable influence on the development of land markets.

Simultaneous viewing of the finest details of a microscope slide has been made possible by the introduction of a new closed-circuit television attachment for multipurpose microscopes. The new National Panasonic system comprising a mini closed-circuit television camera, a nine-inch black-and-white television monitor, and an attachment to link the camera to the microscope is distributed in the United Kingdom exclusively by Teletronic Ltd, 9 Connaught Street, London W2 (price of the system is £507, extra camera complete with microscope attachments, £275 each). Up to 10 large screen television monitors can be added to the system, which has been designed for use in universities, research laboratories, hospital and medical schools and industrial training.

'The Pru', a long-term recruitment film produced by Prudential Assurance, traces the history of the company since its inception in 1846. The 20-minute colour film aims to

Data General has added DOS (Diskette-based Disc Operating System) Basic Programming Language capability to its range of MicroNova microprocessors-based computers (available from Data General Corporation for a fee of £712). Featuring string arithmetic and matrix I/O operations, Basic under DOS is a subset of BASIC (Basic Time Disc Operating System) Extended Basic. It is available in both single and multi-user versions and facilitates programme development in a variety of areas including business, education, industrial control and scientific research.

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**TANDBERG**  
Education Division

# Tuition fees: those in greatest need will suffer most

Ernest Rudd describes the results of a survey of self-supporting students at Essex University

How far do we know who is being hit by the massive rise in fees in higher education next year? We know it will affect over 500,000 students—both undergraduate and postgraduate—unless they are being supported by their home governments, the British Council, Commonwealth Scholarships, or some similar source.

We also know it will not affect most British students, as they have grants. Indeed undergraduates on the minimum grant will be marginally better off, since rather than receiving £50 and paying fees—until recently generally about £70—they will receive no grant but pay no fees.

This leaves the self-supporting undergraduates who have to find, out of their own pockets, £750 a year if graduates, or £500 if undergraduates (plus students' union fees of say £30 or £40).

Relatively little is known about those United Kingdom undergraduates who, although they are not bound by law to be allowed a grant for a first degree course, are nevertheless without one.

To find out who they are, and how they support themselves, I looked at every case at Essex University in this category, talking to nearly half, receiving letters from some, and looking at the information the remainder put on their UCC forms.

At Essex of the undergraduates paying fees at the United Kingdom rate, one in 15 has not even the minimum grant, generally because he or she comes into one of the categories specifically excluded from statutory awards under the extraordinary complex and complicated regulations by which they are governed.

The students fall into three broad groups, within each of which there are many sub-groups. The most obvious group (a quarter of the total) already hold certain qualifications for which grants can be given (not all of them actually had grants). In most cases this earlier qualification was not a degree; generally it was a teaching qualification, or something similar at below degree level.

Most of those without a degree, especially amongst the more mature students, are women—society has tended to put girls into teaching, nursing, and similar jobs where boys of equal ability would be more likely to go to university.

Some parents had gone beyond encouraging their daughters into lower level courses when they were younger, and had put obstacles in the way of their reaching university. A few had given up an earlier attempt at a degree on marriage, and this, too, would bar them from a mandatory award. As one of them said: "My husband didn't see why, when he was illiterate, I should have a degree."

The mental stereotype I have of most of this group is of a woman who trained as a teacher, worked for some years at a job that gave her little feeling of satisfaction, and then came to university, rather than to train for something more to her liking, and now, in her late 30s or early 40s, when her teenage children are able to look after themselves, is at last where she has always wanted to be—at a university where she can get the intellectual stimulation of a degree course.

For such women, the second chance offered by an Open University course is out of the question—it would mean studying at hours when their families are at their wits' end, and they are not, in their own minds, ready to break out from the intelligent housewife's feeling of intellectual isolation, and this the Open University does not offer.

Also in this group are a few, generally rather younger, who are trying to gain not a new career, but better promotion prospects in their old one. They are from occupations—such as librarianship, social work and teaching—which are moving rapidly to an all-graduate intake, and they are looking for promotion prospects being shut off if they do not gain a degree.

Finally this group includes some who have already taken a degree. Those at Essex have mainly done badly in their first degrees and are trying, again, sometimes many years later, in a different field.

Nearly all the students from this group were having considerable financial problems and said that, if the present fees were at the level fixed for next year they would have had to give up.

The second group, two-fifths of the total, are more surprising; by any commonsense definition they are overseas students. Neither they nor their parents are British citizens. They were born and brought up overseas, where their parents remain, and they have come to Britain solely for their education.

However, none of these facts are relevant to the question of whether they are home students for the purpose either of a grant, or paying fees at the United Kingdom rate. For a grant, an undergraduate has to be "normally resident" in the United Kingdom for three years immediately before the first of September of the year in which he or she enters university; to pay fees at the United Kingdom rate, it is enough to be in Britain for the three years before the university course begins (or to meet certain other fairly complex requirements).

Many of this group, while counting as United Kingdom students for fees, failed to get grants because they had arrived during the September three years before their university course began. Also there were a few others eligible for the United Kingdom rate of fees while ineligible for a grant, for example the children of diplomats, representatives of foreign governments, or students from the Channel Islands.

Many of the remainder seemed to be eligible for grants from the I.A.S.s but had failed yet to obtain them because someone had told them they were not eligible for a grant, because they were put off by the complexity of the form they had to fill in and misinterpreted some part of it as meaning they were not entitled to an award, or because they were too difficult in getting statements of parental income that were acceptable to the I.A.S.s.

This is a minor aspect of a major phenomenon. Very substantial numbers of students are coming to Britain from overseas, taking A and A levels at schools and technical colleges, and then becoming eligible for a maintenance grant from an I.A.S. while studying for a first degree.

In some cases they are coming from the poorer underdeveloped countries, but most often they are from elsewhere, and especially from the oil-rich states of the Middle East. In some cases their country's embassy helps find a place at a technical college; but they live on their savings, any money they receive from occasional jobs, until, on entry to university, they get the I.A.S. grant, which at least reduces their reliance on these sources of support.

Whatever one believes a national policy on overseas students' fees ought to be, it is difficult to justify the present system under which students from overseas who are somehow able to support themselves in this country for three years are then given a university education largely at the expense of the British taxpayer.

Nearly all of the remaining students—a third of those covered by the regulations in other ways. Two regulations in particular are being used to dobar a number of students from grants. One prescribes that an application for an award has to be made before the beginning of the course of study.

This hits those who leave school for a year or so before going to university—most schools ensure that their pupils fill in the right forms at the right time. The other regulation under which some are refused awards is that the student should have been "ordinarily resident in the United Kingdom for the three years immediately preceding his degree course. This cuts out British students if they have gone to work overseas for a period between school and university.

Most potential students benefit greatly from a year or two outside their educational system before they come to university, and one would have thought that the experience of living and working overseas would be especially valuable; but, for and against, local authorities looking for ways of cutting their expenditure, such arguments are irrelevant.

The increasing reluctance of I.A.S.s to make discretionary grants is also hitting those students who repeat a year of their course. The I.A.S.s are becoming much tougher about such cases, however legitimate the reasons.

Given the complexity of the issues involved, there is only one answer—a thorough and embracing review of the present system of grants and fees for undergraduates. And the terms of reference of any committee working party that is set up to do this will, if its recommendations are to have any hope of acceptance, have to include the restrictions within the current limitations of public expenditure.

The author is reader in sociology at Essex University.



Students demonstrate against higher tuition fees in London last week.

Lastly, there are a very few students who are prima facie eligible for grants but have not applied for them. In a few cases they have substantial private income, or their parents have substantial income, and they believed they would get nothing, though in fact they would have received £50. Next year, when a minimum grant becomes worth some £540, such mistakes will be come less frequent.

There are three aspects of the whole situation that are extremely worrying. The first is that (although not all the cases I have described are equally deserving of sympathy) a substantial number of people who, by any standards of social justice, ought to be supported, or at least substantially aided, through the degree courses are being prevented from attempting them without great hardship.

The second is the supreme inhumanity of the rules on overseas students. The third is the decisions that have produced it: state could have been made at a time when the problems had described stem from the many unsatisfactory features of the present grants system—the raising of fees has merely exacerbated problems that were already there; and even these are only a tiny part of the unsatisfactory state of the present grants system. (See, for example, my previous articles of mine in THE TIMES on April 13, 1973, October 24, 1975, and December 10, 1976.)

In my own book, *Giordano Bruno and the Hermetic Tradition* (London, 1964), I suggested that Bruno's Hermetic universe turned into "something like the mechanical universe of Isaac Newton". It now appears that, after study of the unpublished papers, scholars are inclining to the view that Newton's mechanics are affected by Hermeticism, so that Newton, too, is in a sense a Hermetic philosopher.

The most startling revelation from the unpublished papers is the fact that Newton was not merely interested in alchemy (as has always been known), but that he devoted more time and energy to this Hermetic pursuit than he did to his mathematical studies. He collected books on alchemy, endeavoured to unravel the scientific processes which he believed to be hidden in alchemical myth, and laboured incessantly to test by experiment the recipes which he believed the mystics' language of the alchemists.

This was in no sense a vulgar pursuit of gold-making, but a religious scientist's endeavour to uncover the divine plan in matter. Newton's alchemical studies were complementary to his mathematical studies. They were rigorously controlled by experiment and exact calculation in a method as carefully scientific as that used in the works for which he is famous, as has been emphasized in R. J. T. Dobbs's recent study, *The Foundations of Newton's Alchemy* (Cambridge, 1975).

Other lines of investigation were pursued by this extraordinary man with equal passion. He was, for example, determined to unravel the meaning and proportions of the Temple of Solomon. This was another Renaissance interest; the plan of the temple, laid down by God himself, was believed to reflect the divine plan of the universe.

For Renaissance scholars, the theory of classical architecture was believed to derive from the Temple and, like it, to reflect world and human proportions. One would expect to find Newton compelling architectural theory and temple measurement to yield scientific results as exact and important in

the research area, two respondents felt that British chemistry PhD may be less effective in their signing research programmes at American counterparts. Two respondents claimed that those who do enter industry may not be the most able, and five that they appeared as "second best" and academically unrespectable.

Eight respondents attributed this to an over-preoccupation in academia with scholarship for its own sake and three to employers' failure to stretch their PhDs and to give them good career structures.

A number of respondents claimed that the American chemistry PhD graduate seems better at taking a broad view of industrial problems, and in having regard to his employer's basic aims, while the British graduate seems to concern himself only with his particular discipline-oriented contribution to the problem's solution.

While there was no overwhelming view that formal courses should be a feature of all chemistry PhD programmes, some respondents of industrialists' course work as giving the American graduate student an advantage. Five respondents felt that it was particularly useful in facilitating teamwork, and five in orientating the fresh graduate to industrial situations.

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Education and Industry

received also from the Manufacturing Chemists' Association.

We received letters from 39 individuals in response to the letter to industrialists and of the 40 to whom we originally wrote; only eight failed to respond at all.

Four of the seven academics responded. Their letters together with the unsolicited comments received, were subsumed with the main body of industrial replies in the detailed analysis.

In reply to our questions about the relative effectiveness of British chemistry PhDs, both within outside research, about half the

industrial respondents in each case gave us an unqualified assurance of absolute comparability of the British and American. The four academics assured us that, while only two of them gave an unqualified assurance on British PhDs' performance outside research.

Of the remaining industrialists and academics, none were highly critical. Where critical comments were made, a particular point was reinforced: at most by 10 of the 43 respondents, but more typically by three or four.

In detail, 10 industrialists said that British chemistry PhDs seem to be less motivated to enter industry than their counterparts. Two respondents claimed that those who do enter industry may not be the most able, and five that they appeared as "second best" and academically unrespectable.

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Malcolm Robinson

The author is education officer of The Chemistry Society.

# Did Newton connect his maths and alchemy?

Frances Yates discusses the impact of Hermetic philosophy on the work of Isaac Newton, who died 250 years ago next week

The work which has been done in recent years on Isaac Newton's unpublished manuscripts has not affected his stature as the brilliant mathematical thinker of the *Principia* and the *Opticks*. But it has altered the context in which we now see Newton, for it appears from the unpublished papers that this major figure in the Scientific Revolution was involved in ideas which we have supposed typical of the Renaissance.

In his revolutionary article on "In Newton and the Pipes of Pan" published in the *Notes and Queries of the Royal Society* in 1966, J. E. McGuire and P. M. Rattansi, from the unpublished manuscripts which showed that Newton believed that in discovering the law of gravity and the world-system associated with it, he was rediscovering an ancient truth, known to Pythagoras and hidden in the myths of Apollo with his seven-stringed lyre.

With this profoundly Renaissance faith in ancient truth hidden in myth was associated Newton's trust in "Hermes Trismegistus" as an ancient Egyptian sage; Newton ignored Isaac Casaubon's late dating of the *Hermeticon*.

In my own book, *Giordano Bruno and the Hermetic Tradition* (London, 1964), I suggested that Bruno's Hermetic universe turned into "something like the mechanical universe of Isaac Newton". It now appears that, after study of the unpublished papers, scholars are inclining to the view that Newton's mechanics are affected by Hermeticism, so that Newton, too, is in a sense a Hermetic philosopher.

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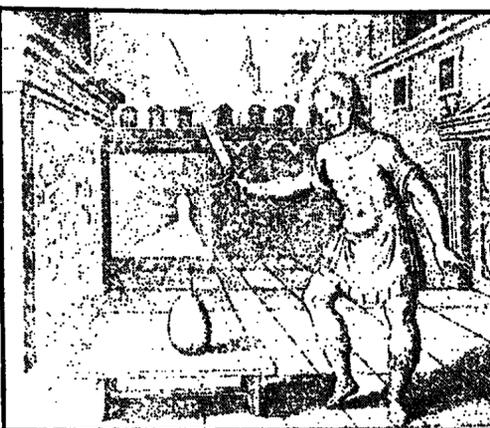
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An engraving from Maler's Atalanta Fugens (1618), in which a philosopher attacks an egg (symbolizing the universe), with perspective (synthesizing architecture and its allied mathematical subjects), and fire (symbolizing the alchemical processes) in the background.

his eyes as those derived from his mathematical and alchemical studies. (Newton's plan of the Temple of Solomon has been published by F. Manuel in his book *Isaac Newton Historian* (Cambridge, 1963).)

Newton was also intensely interested in the chronology of world history and in prophecy. He worked out chronological systems based on the prophetic books of the Old Testament, hoping that here also, by more rigidly accurate combination of such materials, he would be able to gain a better grasp both of past history and of prophetic insight into the future. In these apocalyptic calculations, Newton's Protestant bias comes out powerfully.

Where in the history of thought, religion, or science can one find a cluster of ideas at all comparable to the amazing content of the mind of Isaac Newton? Though this question cannot be answered as yet with complete confidence, there are certain fairly obvious clues which demand investigation.

Among the large number of alchemical writers studied by Newton, one of his favourites was Michael Maier, whose works were copied by him again and again. Maier belonged to the early seven-

teenth-century German Rosicrucian movement; he made a particular study of alchemical thought, hidden writings are close in spirit to those of John Dee, whose philosophy underlies the Rosicrucian manifestos. Dee's mysterious *Mutus Hieroglyphica* is probably alluded to in one of Maier's alchemical emblems. Dee's *monas* was a symbol which reflected for him the mathematical and alchemical thought in such a way as to achieve insight into "one truth" behind nature.

Another alchemical volume which Newton studied deeply and copied was Elias Ashmole's *Theatrum Chemicum*, a collection of alchemical texts among which is a short description in verse of Dee's *monas*.

It seems not unreasonable to ask whether part of Newton's interest in these texts might have been because he sought in them possible connections between alchemical and mathematical thought—his own dominant interests—which Dee would seem to have found significant ways of combining. At any rate, he must have read about Dee in the *Theatrum Chemicum*, and heard of his mathematics through the alchemical volume to which he attached such importance.

Among those probably connected with the antecedents of the German Rosicrucian movement was Simon Studion, whose unpublished treatise, written in 1604, has the title *Numeria* (temple-measurement). It is a most elaborate account of measurements of the Temple of Solomon, combined with theories of world-history, significant historical dates, and apocalyptic prophecy, all in a strongly anti-papal vein.

Studion's outpourings belong to a class of literature which Newton knew and used in his own unpublished account of the Temple, and have suggested in *The Rosicrucian Enlightenment* (London 1972), that Studion's prophecy that the year 1620 would see the downfall of Antichrist (the Papacy) may have encouraged Frederick the Elector of Saxony to his own autoprophetic the Hapsburg powers. This suggestion cannot, of course, be proved; but a reading of Studion is certainly evocative of the atmosphere of those times.

Following Maier as a clue has led into a cluster of ideas relating to alchemy, mathematics, prophecy and astrology, which are strikingly preoccupied Newton. They belong to the period of the politico-religious movement which failed so disastrously in 1620, a failure which almost overwhelmed the cause of Protestantism in Europe.

Idea from those times would have reached Newton through the Protestant tradition, of which he so strongly approved. Those who believed intensely in Protestant principles viewed with passion the collapse of Protestantism in Europe; some of these passions may have gone into Newton's intense search for God in mathematics, alchemy, and Biblical prophecy.

If the movements outlined here seem possible as the historical preparation for Newton, the problem still remains of explaining the changes which later in his life Newton's type of outlook and personality—such as that of John Dee—into the personality and outlook of the seventeenth-century scientist, Newton.

# Peter Sheldrake argues that tertiary education units in Australia need to develop a firm basis in research. A misconceived emphasis on training teachers

In a recent article (*THE TIMES*, November 26, 1976), I criticized some of my colleagues in tertiary education units for the limited quantity and quality of their output. Little by way of intellectual or methodological advance has come from the many units in Australia and elsewhere, and one particular aspect of this problem, I suggested, relates to the epistemological nature of education itself.

For education is an applied discipline or practice, and would be a better world, and lacks an intellectually coherent core, a set of concepts and theories that are its own; rather it draws on the theories and methodologies of a number of disciplines.

In the case of tertiary education, particularly when it focuses on teacher training and staff development, the source of legitimation tends to be the norms and values of educationists themselves, as much as the knowledge derived from other disciplines.

Of course, the same comments about the lack of evidence of a productive and fertile body of ongoing research could be made about education itself—and often is. With some truth, the further observation is made that education is dominated by teacher training, and particularly by the training of primary and secondary teachers.

The same three "explanations" I offered in relation to the poverty of "pure" research in tertiary education apply equally to the more general subject.

But education is not alone among recognized academic subjects in having an applied concern; the same is true of engineering, accountancy, medicine or law, all of which are respected disciplines in the university world. However, a brief review of these other subjects suggests that the way in which the "applied" interacts with the "pure" varies considerably, and there may be a lesson for education to learn.

In engineering and accountancy, the subject taught by the university is that which is seen as the basis of the education of the professional engineer or accountant. In engineering this includes subjects like applied mathematics, materials science, geology, structures, and so on; in accountancy, economics, business methods, corporate law, and so on.

The practical side of training is left to postgraduate experience—with a combination of further qualifying examinations and probationary service. Medical training brings some of the practical preparation within the ambit of the undergraduate course, and attempts to demonstrate the relevance of the previously taught theory, and in law there is a slow movement in the same direction.

In education the strategy is rather different: we allow students to study any subjects initially, and then teach them courses that are clearly vocational and applied from the outset. The problem of courses that use striking subjects for education—such as psychology, sociology, history or philosophy—are not part of education as such in the way that anatomy, physiology or biochemistry are, despite part of medicine overlapping with education.

Nor, given the serious teacher-training bias of the subject, are they sufficiently developed to represent specialized areas within established disciplines, as mature science can be in departments of engineering, or economics in accountancy. Indeed when we turn to look at research interests we find that the orientation is curiously parasitic, the major emphasis being placed on studying the teaching process itself, and its effectiveness.

We would consider it odd if doctors spent most of their time carrying out research in the therapeutic relationship, or as we now consider it odd that they spend no time on this area, and yet we see educational research overwhelmingly devoted to scrutiny of practice, and larger questions slipping by the board.

University departments of education have in other words emphasized in the future if they are to maintain academic respectability in the university, and I believe they must do this by placing less emphasis on teacher training and more on research in other words on developing our theoretical and methodological understanding of human development and learning in the broadest sense.

In education this general view was given a sharper edge by the recent Australian Universities Commission Report for the 1977-80 triennium, which commented that: "universities have agreed to ensure that the intake of students to pre-service courses are not increased; indeed, the Commission has requested universities to effect some reduction where possible. The Commission has indicated that in its view the universities should begin to concentrate more on advanced and postgraduate work in the field of education..." (para. 3.9).

Such a view is unattractive. The general implications of the binary system have yet to be worked through in a systematic fashion, but acceptance of some kind of functional direction implies that the strictly vocational should be moved out of the universities, and taught only in the CAEs.

In education, the choice is clear: in other subjects—such as post-graduate, or vocational, training in medicine or law—the vocational is clear cut, and at present the universities seem to be competing with the CAEs to run the vocational courses, as well as the non-vocational. This is a mistake; indeed, a fundamental error which could be avoided on the very position that universities have so far fought to maintain.

Need for research

Of course, the definition of "vocational" needs some clarification, and these cases be made for viewing the most broadly based, and as a liberal arts education as vocational, as Troyvid and McLaren do in their case for the CAEs, *Equal but Different* (Melbourne University Press, 1976).

However, I suggest the argument makes more sense the other way round; namely, that universities should not have their concerns and interests circumscribed by the narrow demands of vocational preparation and manpower requirements.

Certainly, the present preoccupation of education with the training of teachers, seems quite misconceived, since appears to have contributed to the limited scope and significance of educational research to date.

Tertiary education units are at the entrance to the same straits, and would do well to avoid some of the mistakes of the past, and need to abandon their reliance on staff training and the advisory role, and must begin to develop a strong research framework to underpin their other activities.

In fact, much of what is currently being done by tertiary units should be part and parcel of every academic's work: the evaluation of teaching programmes, the assessment of teaching effectiveness, relationships with students, and so on. All these should be a continuing professional concern, and the tertiary units do no more than help and advise where necessary—not make over these tasks.

Indeed, the situation of tertiary education units and education are so similar that the two should work together. The role and work of the tertiary units is now sufficiently well known, and the staff concerned, the initial "encounters" about the "autonomy" of units no longer carry the same weight.

Good staff will work well, and confidently, whether they are in an autonomous unit or part of a school of education, and the benefits of working with like-minded colleagues outweigh the few advantages of working alone and in isolation.

Indeed, I am even prepared to go as far as to suggest that the location of tertiary education units within schools of education would have a beneficial (even rescuing) effect within the school and help wean staff there away from an excessive dependence on teacher training. For the smaller units in Australia, in times of evident stringency, the move might be precipitous all round.

The author is director of the educational research and resources unit at Flinders University, South Australia.



NORTH AMERICAN NEWS  
MICHAEL BINYON reports from Washington

### Army centre to house gene experiments

A national centre for genetic experiments using the recombinant DNA technique is to be established by the National Institutes of Health at Fort Detrick, the army centre for biological warfare research.

Existing laboratories at the Maryland centre will be modified and upgraded at a cost of \$3m to deal with the highest level of government research DNA activities.

Work will probably focus on the cloning of human and mammalian genes, according to Dr William Garfield, director of the NIH Office of Recombinant DNA Activities.

### Blacks found more likely to study than peer group whites

Black school leavers are more likely to go on to post-secondary education than whites from similar economic backgrounds, according to a government study.

More than 85 per cent of the most capable black high school graduates from middle and upper income areas are now college students, two years after leaving school. This compares with less than 80 per cent of the brightest white students from similar backgrounds.

### California 'owes \$5.6m'

The University of California has been told to repay the Government \$5.6m because it cannot properly account for how the money was spent.

The federal auditors say the university has not documented expenditure for services, consultants fees, summer salaries, vacation pay, or cost transfers charged against federal research funds.

## More openings for graduates

There appear to be more jobs for this year's college graduates than for several years, according to the College Placement Council. Women's prospects seem particularly bright.

The council, in its mid-year salary survey, found that at the Bachelor's degree level 49 per cent more job offers were reported than this time last year. At the Master's level, the volume was up 74 per cent. At the Doctoral level it was 73 per cent higher.

For women, the number of salary offers rose 86 per cent over last March, and last year had already shown a gain of 27 per cent over March 1975. The volume for men went up 45 per cent. A year ago men had experienced a 20 per cent decrease.

Despite these gains the proportion of women's offers to the total for all BAs remained only 18 per cent. This is, however, still an improvement on the ratio of 11 per cent in 1975.

At the Master's level, the volume for women increased 30 per cent over last year, while men received 60 per cent more offers. Women's share of total volume was 16 per cent. Two years ago, women accounted for only 10 per cent of the Master's offers.

This is the seventeenth annual survey by the council. It is based on job offers, not acceptances, made to college students in selected fields and graduate programmes during the recruiting period, September to June.

Engineering continued to attract the most interest from employers. About half (47 per cent) of all the offers went to engineering positions. Accounting and auditing contributed 25 per cent of the total, with the remaining 28 per cent being divided among 21 other functional areas.

Business employers stepped up their recruiting, the most making 59 per cent more offers than last March. Offers in the industrial sector and in educational institutions also went up 50 per cent. Government agencies made only slightly more offers than a year ago.

In terms of dollar averages, petroleum engineering, a small but growing field of study, was far ahead of all other curricula at the Bachelor's level, with an average offer of \$1,508 a month—a gain of almost 8 per cent since last July.

At the Doctoral level, chemical engineering had the highest average at \$1,867, following a 2 of 4 per cent.

These figures were even higher at the level of other Bachelor's degrees. Other Bachelor's degrees averaged \$1,100, with civil engineering at \$1,300 and chemical engineering at \$1,200.

The scientific disciplines generally experienced gains of 2 to 5 per cent, with average dollar offers ranging from \$851 for the biological sciences to \$1,085 for computer science.

Despite increases in volume, humanities and social sciences had average offers slightly below last July's figures. The 576 offers for humanities was only one-half the petroleum engineering average. Modest gains of 3 to 5 per cent were reported in law, business disciplines with averages ranging from \$865 for marketing to \$1,064 for accounting.

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William Purvis reports from Sydney on the outlook for the new academic year in Australia

## Job concern among both staff and students

Economic factors dominated the prospects for staff and students of Australia's 19 universities as they returned to campuses for the start of the new academic year this month.

During the summer vacation national unemployment reached nearly 6 per cent and inflation continued at an annual rate of about 14 per cent—worrying statistics for administrators, staff and students.

Although the 154,000 students pay no tuition charges, they must pay union fees and levies which this year will average about \$5100. Normally most students would be able to make ends meet but this year there are 40,000 jobless competing for any work available.

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A major academic freedom dispute has arisen in the Republic of Ireland  
John Horgan reports

## Church row over 'dismissals'

The Catholic bishops who act as trustees and governing body of St Patrick's College, Maynooth, have lost a wide-scale academic controversy by writing to two members of the college staff threatening them with dismissal if they do not offer to resign.

The two men concerned are Mr Mahony O'Rourke, a lecturer in French, and Father P. J. McGrath, professor of logic. Mr O'Rourke was a priest until he was released from his vows last year.

Both men hold teaching posts in the college, which is a recognized college of the National University of Ireland. Their salaries are therefore paid by the state, although the bishops in the college argue that some of his writings have brought the college and the Catholic Church into disrepute.

The position of the two men will be substantially better when the Unfair Dismissals Bill, which is currently going through the Irish Parliament, has been passed. This will give them the right to appeal in certain circumstances to the Labour Court if they feel that they have been unfairly dismissed.

The whole affair also has substantial implications for the new legislation which will give independent status to Maynooth and to a number of other university colleges around the country. As things stand at the moment Maynooth is governed solely by the bishops, and not even its president has a place on the governing body.

Patrick Knight on a growing Brazilian research centre

## Amazonian incentives

Two years ago only 38 research staff were working at the 22-year-old National Institute of Amazonian Studies (INPA) on its site on the outskirts of Manaus, deep in the Amazonian jungle.

Now, says Dr Warwick Kerr, a previous chairman of the Brazilian Association for the Advancement of Science, INPA has 138 researchers, 60 of them from abroad.

Its budget has risen from \$4.5m in 1975 to \$10m this year, despite a general cutback in research spending. This is partly due to the fund-raising talents of Dr Kerr, and partly because of the realisation of the urgent need for research into Amazonia and its problems.

INPA is divided into four divisions: agronomy, sciences and special projects. It does not touch areas, such as minerals, which are the responsibility of separate government agencies.

Foreigners are being recruited because able foreign research staff are cheaper and easier to get than Brazilians at the moment. A European or North American can be persuaded to work in Amazonia for a few years for far less reward than his Brazilian counterpart.

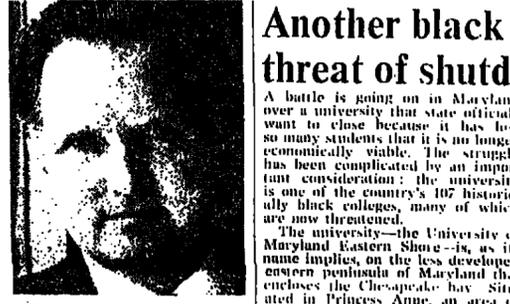
There is a severe shortage of qualified Brazilians at all levels, and to attract them to Amazonia would prove prohibitively expensive. So Dr Kerr is able to take full advantage of the current academic recession in the northern hemisphere. There are six scientists from Britain among the foreigners.

The INPA line tends to be a critical one. It is distinct in many respects from the current government policy of developing Amazonia at all costs and as quickly as possible. One of the broadest lines of research at INPA is into the ecology of the region and the various development schemes are being.

For example, one fifth of Amazonia's 35m hectares were zoned for cattle raising a few years ago. Work done by INPA scientists has shown that ranching and such high costs as to be hardly worth it. It is frequently found that four hectares, roughly nine acres, are required to sustain one steer. Yet tens of thousands of hectares have already been cleared.

Medical sciences receive a lot of attention at INPA, as the vast majority of the Amazonian population suffers from at least one debilitating disease. There are still great health dangers in the region, illustrated by the death from malaria in January of a senior medical researcher at the Institute. New types of mosquito resistant to DDT are now appearing.

The EEC European Centre for the Development of Vocational Training opened in Berlin this month. The centre was created as a result of the 1974 Social Action Programme adopted by the Council of Ministers.



Professor Jensen: "muddled decision"

## Jensen choice criticized

Professor Arthur Jensen, the Berkeley psychologist whose controversial research into the link between race and intelligence has been bitterly attacked, has been elected a Fellow of the American Association for the Advancement of Science at its annual meeting in Deer.

His election was strongly criticized by a group of scientists at the meeting. Margaret Mead, the famous anthropologist who was last year's chairman of the board, said she would fight the decision, which she called "muddled".

The professor Jensen was among 178 scientists elected to the association's board vote 39 to five in his favour, with 10 abstentions. Altogether there are about 16,000 Fellows of the association.

## Education lobbies get new heads

Dr J. W. Poltson, Chancellor of the University of Illinois at Urbana, is the next President of the American Council on Education, the country's major coordinating body in post-secondary education. He succeeds Dr Roger Heys, who is resigning.

Another education lobby group, the Association of American Universities, has elected Dr Thomas Bartlett, President of Colgate University of New York.

Until now the association, which represents 50 leading public and private universities, has had a part-time president, now held by Dr Kingman Brewster, President of Yale.

The association, which includes the most prestigious universities in the country, is now expected to take up the concerns of research workers with the federal Government.

## Another black college faces threat of shutdown

A battle is going on in Maryland over a university that state officials want to close because it has lost so many students that it is no longer economically viable. The struggle has been complicated by an important consideration: the university is one of the country's 107 historically black colleges, many of which are now struggling to survive.

The university—the University of Maryland Eastern Shore—is, as its name implies, on the less developed eastern peninsula of Maryland that envelopes the Chesapeake Bay. Since 1960 it has lost 50 per cent of its students, and its high unemployment, its low wages, and its lack of jobs for 400 local people.

The problem is, as a recent report pointed out, that the university's enrolment is shrinking fast. In the past two years it has fallen from 956 to 729. Costs per student have now risen to \$6,633—the highest of any state college or university in Maryland (except the medical schools).

Meanwhile, Salisbury State College nearby—predominantly white—has increased its student numbers rapidly in the past two years, and costs per student are less than half those of the university's.

The report says the state's Board of Higher Education should close the university and relocate its teachers and students in other state colleges.

The university began in 1886 as a high school for blacks. When the state college system was founded, blacks were not admitted to a main university campus near Washington, and so it became an agricultural college for blacks.

For years the college suffered from low academic standards, lack of money. After the 1954 legislation outlawing racial segregation was won, there was a surge of integrating students. In 1970 it was upgraded to a full part of the state university system, and buildings were put up, and good teachers hired.

But the academic standards applicants remains low. Of the 1,000 students enrolled last August, 400 were found deficient in reading, writing and mathematics. One of them had not read a single book since his entrance four years of high school.

The university argues that it is not just such students that it is unable to play. Special programmes improve their basic skills, and a lot of money is spent bringing students up to the standards of those in other branches of the state university.

A number of black organizations have rallied to the cause of INPA, and are resisting attempts to shut it down. One dilemma is how black college students remain. Some \$2 per month in tuition is now being paid by the state, but white enrolment is up down to 24 per cent, while in Salisbury State it is 92 per cent.

The government has decided that expenditure on universities will increase in 1977 by only 2 per cent. However, the new universities will carry a disproportionate share of this small increase, which will have increased financial problems for some of the others.

Macquarie University, for example, will have a total student body of more than 10,000 and is no longer content with a new and steady maintenance of last year's standards. Maintaining last year's standards would have meant a deficit of about \$250,000.

## Record strike comes to end

The strike at the University of Quebec at Montreal has finally ended after 133 days. It was the longest strike ever at a North American institution, lasting 26 days more than the record set by a dispute at Laval.

Six weeks of classes had already been held when the strike began on October 18, and so the rest of the autumn term will be completed now. A special 12-week "winter" term will be held May 2 to July 22, and the summer term will be cancelled.

The strike, like that at Laval, was mainly over the say of the teachers in university government. Under the terms of the agreement they will have more say in hiring, granting tenure, staff evaluation, and the creation of new posts. The university senate will have final authority over the curriculum.

The agreement also provides for a reduction in part-time staff from 42 to 33 per cent by 1979, and an average salary increase for all teachers of 17.5 per cent.

## Shake-up for HEW

Mr Joseph Califano, Secretary of Health, Education and Welfare, has announced a reorganization of his department which, he estimates, will eventually save \$2,000m a year.

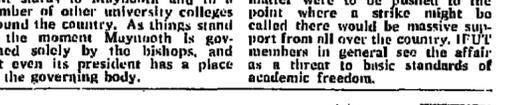
Most of the changes deal with health and social security functions of the vast department, and are aimed at consolidating medical programmes and getting rid of a feud.

Although education will not be greatly affected, eight different departments are now being merged into a single unit.

Mr Califano called the shake-up the most far-reaching in the department's 24-year history. He said the purpose was to make HEW a more effective and more unified organization.

The changes inevitably raise the question whether there will be any further reorganization of education departments. Mr Califano is known to be extremely cool towards an idea of splitting HEW, although a separate Department of Education has been mentioned several times in the past.

President Carter during his election campaign.



The Amazonian Studies Institute at Manaus

## West Germany Swingeing cuts planned in teacher trainee places

The University of Munich, the largest in the whole Federal Republic, would lose 65 per cent of its students studying to become teachers. Instead of 11,000 there are now only 3,925 places envisaged.

The number of art students, for example, would be reduced from the present 8,000 to 2,800 and the present 2,800 students from 1,200 to 400. The Spanish department would be closed down altogether.

It remains to be seen whether it is legally possible to reduce the student capacity in individual subjects in this way or whether it will be necessary to implement across-the-board cuts in all subjects taught at the university to reduce the total number of students.

## EEC vocational training centre opens

The EEC European Centre for the Development of Vocational Training opened in Berlin this month. The centre was created as a result of the 1974 Social Action Programme adopted by the Council of Ministers.

The centre will assist the EEC Commission in encouraging, at Community level, the promotion and development of vocational training and continuous further training.

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### Education and industry

## Not more but better engineers: more means worse scientists?

The most important public issue for higher education in 1977 is getting its relationship with industry—and the wider world of work (and wealth?)—right. It must be put in this simple and perhaps unhelpful way because no one seems at all clear what is wrong. An almost atavistic feeling that somehow the present relationship is not quite right seems to be far more significant than detailed and specific complaints about what is wrong.

Yet in spite of the dangerous lack of definition about the roots and the dimensions of this "problem" it has nevertheless been elevated into an important public issue. On its satisfactory resolution will depend not only the good name of universities and colleges but the generosity of the public funds that will be made available to them in the coming years. It is for these reasons that *The Times* has published in the past month a series of major articles on this theme.

One reason for this lack of definition is that this "problem" of the correct relationship with industry is not indigenous to higher education but has been imported from the schools where in the form of Mrs Williams's Great Debate it is concerned primarily with standards but obliquely with employability, and from politics where the Government has plugged its hopes on industrial regeneration through a post-war industrial policy. This means that the opinions (and the prejudices) of industry are licensed to with more attention than might have been the case five years ago.

Another reason is the disjunction between the quality of British higher education and that of British industry. If a league table of countries was constructed in terms of the quality of their universities and colleges, Britain would be very close to the top. The only certain superior would be the United States. Even in scientific and engineering higher education—the area of alleged weakness—few institutions outside the United States can be compared to Imperial, UMIST,

Southampton and other British universities and colleges.

Yet the visitor to Paris or Brussels is reminded immediately of Britain's position in the economic league table, struggling among the relegation candidates at the bottom of the first division. In a few years a visit to Barcelona or Athens may be equally revealing. Perhaps it is hardly surprising that there should be some occasional differences of emphasis between a higher education system appropriate to an advanced, progressive and technologically sophisticated economy and an economy that can no longer honestly be so described.

A third difficulty arises because there seem to be two distinct strands in this inchoate dissatisfaction with the present relationship between higher education and industry. First, there are what could be called the micro-problems: the failure of universities and colleges to recruit such able students for science and technology courses as for those in arts and social sciences and the perennial mismatches between the output of graduates and the available jobs in specialized areas.

Secondly, there are the macro-problems: the apparent lack of respect on the part of many in higher education for the creation of wealth in a free enterprise society by getting one's hands dirty—sometimes literally by being an engineer, sometimes metaphorically by making profits—and the lack of scientific and technological literacy among policy-makers and citizens generally.

All these, often quite discrete, phenomena have been mixed together in some gigantic goulash-like "problem". Few people have paused to consider seriously whether the solution to one difficulty, for example the mismatch between supply and demand (in which much exaggeration might be a danger), might make another worse. Now there is a fact that universities and polytechnics all too uncomfortably aware of the beady gaze of Government and industry upon them may rush to provide answers before they have

reality considered what the questions should be.

In the past this indiscriminate approach to the delicate and many-sided relationship between higher education and industry has encouraged two stock responses, the exhortatory and the linear. The first proffered by Government and CBI, was based on the assumption that the "problem" could be solved if universities were subjected to a rhetorical blitzkrieg; the second, proffered by many scientists and engineers in higher education, on the assumption that following the example of General Haig the "problem" could be solved by more bodies.

This is still the most dangerous policy—to try to take into higher education more precisely to projections of manpower needs. This would inevitably encourage excessive specialization of courses and compartmentalization of disciplines—because that is the way industry would like it and to be fair it is difficult to see how such detailed manpower planning could be attempted with any prospect of success if the various categories of skills and jobs were not disaggregated as far as possible. Graduate scientists and engineers would find themselves walled up in an academic/vocational ghetto only a little less secure than that in which teachers are imprisoned.

In fact more and more graduate scientists and engineers trained in narrower and narrower specialisms are not needed. There must not be discouraged in research and development. Indeed there is a grain of truth in the heresy that Britain has too many scientists, not too few, in R and D. Nor is there an absolute shortage of engineers although here a question mark hangs over their quality. A sensible policy would be to attempt to bring the balance in the universities from research to engineering. Both the SRC and the UGC seem to be trying to do this. There may also be a case for the greater concentration of very high quality scientific and engineer-

ing education but this should probably be part of a much more fundamental restructuring of higher education rather than an isolated solution on the SISTERS pattern.

A second requirement is that there should be many more people with a scientific and in particular technological background among those who make the strategic decisions about the development of the economy—and in the future these strategic decisions are us likely to be taken in Whitehall as in the boardroom, whatever the political complexion of future Governments. It is simply not adequate in a society of growing technological complexity that so many of its leaders, official and unofficial, are history or law or economics (or even economists). The bias is entrenched because these subjects are seen as suitable vehicles for the general education of a future elite while chemistry and physics are not. The contrast with France is striking. There the elite sector of higher education, the *grandes écoles*, are predominantly scientific and technological institutions (with some distinguished exceptions like the *École Normale Supérieure*). Latin is for the also-rans.

The third requirement is the most important of all. The weakness in Britain's economy and society lies as much in the middle as in the top—middle-managers and salesmen with habits that are more bureaucratic than entrepreneurial, and technicians whose self-esteem has been deflated by the increasing number of graduates (who in turn are often dismissed because they are forced to accept jobs which they regard as inappropriate). If Government is serious in its intentions to enhance the contribution education makes to industrial progress, it should give more resources to the development of technical education, extend day release within the framework of the tertiary sector, and expand opportunities for more advanced education through a network of community colleges.

## LETTERS TO THE EDITOR

### Demand for engineers

Sir.—Articles have appeared in the educational press recently challenging the need for this country to produce more engineers. It is of course difficult to see very far ahead in the matter of manpower forecasting but a country such as the United Kingdom whose very existence depends upon its productive capability must surely place its resources in the most likely to contribute significantly to the total industrial effort.

I believe it would be quite impossible to overproduce well qualified and able engineers. What we must guard against is producing too many poor engineers and too few technicians.

We are however in a parlous economic situation and at the moment we have, as a nation, invested heavily in a broad spectrum of educational effort and resources being rightly asked whether we have invested wisely and whether our educational (and training) plans are heading in the right direction.

This inevitably poses the question—should our immediate aims at the higher educational level be to support vocational education rather than non-vocational courses? The trouble is that because the time constraint in education is so tight, we have to choose our priorities and hence we are, in time at least, five years hence.

What I fail to understand in all this argument and debate at the moment is why the vocational aspect is considered so important for scientists and engineers, yet is largely mentioned in the case of the students of the humanities, social science, or arts. Because a student begins a course of study in engineering he has no right to assume that a suitable job will be waiting for him when he qualifies. However it should be patently obvious that his chances of securing a job in his chosen profession are far higher than his arts counterpart.

In other words, from the point of view of return for investment there is much to be commended in backing technology courses. This does not suggest that we ought to abandon the arts, still or allow it to atrophy but merely to recognize the fact that in times of stringency it is necessary to make a choice.

resources in areas most likely to be productive (in no sense than one). And what if we do cause the pendulum to swing too far and overproduce engineers—will this be so frightful?

A degree course in engineering is an excellent education in its own right, often broadly based and producing men (and too few women) capable of adapting to changing circumstances and able to undertake a variety of tasks not necessarily directly concerned with technology.

They will certainly be no worse off than unemployed graduates in arts and they could be a lot better off. The source of our difficulties starts in the schools. For too long we have had too few capable science and mathematics teachers involved in the 11 to 16 age range and for too long have new experimental methods—for example, Nuffield Physics and the School Mathematics Project—been allowed to continue without a critical reappraisal of their worth.

These factors have contributed to a situation in which relatively few able pupils (especially girls) choose technology and many choose arts or "soft science". It would be quite wrong to place an excessively high level of places on the new physics and mathematics courses in schools.

Returning however to the original question of too many engineers, the problem really lies in the definition of the term engineer. The difficulty is getting the future ratio of good engineers to technicians right and a general acceptance of the worth of an engineer to society at large. I do not think we need worry about producing too many good engineers. There probably will not be enough to go round.

Yours faithfully,  
R. F. CLAY,  
Dean of Engineering,  
Hatfield Polytechnic.

Sir.—The "myth" of the shortage of engineers in this country cannot be exploded quite as glibly as your report (*THESE*, March 4) seems to suggest.

That British industry requires a steady stream of highly intelligent

and well educated engineers to maintain its competitive position in world markets is obvious. Such a stream must flow from our schools, where boys and girls, influenced by parents and teachers and the fashions of the day, select the subjects they will study in the sixth form and the university departments they will seek to enter. Teenage decisions of this sort today will eventually have their influence on the performance of our industry in 10 to 15 years' time when those particular individuals move into positions of responsibility.

The high technological standard of our chemical and processing industries, for example, is now being maintained by the abilities of our young, experienced chemical engineers who left our universities in good numbers in the late 1960s.

What should be giving us concern is that whereas in the late 1960s over 1,000 United Kingdom students sought entry to chemical engineering departments this figure had been halved by 1974. Such a decline in applicants leads not only to fewer new graduates three or four years later but also to at least some universities being tempted to lower standards to maintain their intake.

The situation is showing signs of improvement: numbers of applicants are rising again. Perhaps Sir Dermot Christopherson's warning is premature but there may come the time, if the trend continues, when universities are tempted to expand intakes to match the rise and so leave it to industry subsequently to select the best and reject large numbers of graduates. Then engineering graduate unemployment would hit the headlines and the whole cycle could repeat itself.

What is needed is a larger number of boys and girls seeking entry to our engineering departments, a higher standard of entry and university intakes on a steady course. Then we can be confident that those who succeed will have an exciting, worthwhile and vitally important career in prospect.

Yours faithfully,  
G. H. ANDERSON,  
Department of Chemical Engineering,  
Imperial College,  
London SW7 2BX.

### French assistants

Sir.—May I ask for a correction to be published on the subject of conditions of appointment of which assistants serve in French schools (*THESE*, March 11)? As your correspondent points out, lecturers are indeed often recruited by personal contact and direct negotiations between modern language departments in France and Britain. This is, however, not the case on the assistant scheme administered by the Central Bureau for Educational Visits and Exchanges and the Office National des Universités et Ecoles Françaises.

Lecturers' hours and rate of allowance have often varied from institution to institution; in both countries, but assistants serve on conditions internationally agreed since 1904-05. A posting to enseignement élémentaire ou secondaire means 12 hours a week as set out in Department of Education and Science Administrative Memoranda 8/76 and 6/75, Central Bureau and Office National documentation and Bulletin Official de l'Education Nationale 1971, no 43, Circulaire Ministère de l'Éducation, no 71-356. "Le nouveau rapport sur la leçon: en France", to which your correspondent refers, deals with the administrative, teaching and material position of the lecturer in French higher education.

It may be a relief for departments of French in British universities to know that no change is intended in the conditions on which their students are currently serving in lycées and collèges d'enseignement

ment secondaire on English language assistants. The French authorities have made enquiries for the academic year 1976-77 and of those 1,425 are from the United Kingdom, 115—United States, 40—Canada, 40—Australia, 36—Republic of Ireland, 10—New Zealand and eight—West Indies.

The scheme is run by the Central Bureau and the Office National on behalf of United Kingdom educational departments and the Ministère de l'Éducation.

Candidates for assistantships, highly recommended or invited to apply for many degree courses in French, are sponsored by universities, polytechnics and colleges of education who have put forward a record number of students, 2,000 for 1977-78. The fortunate few who receive a posting will be glad to be assured that their load is not going to be doubled nor will overtime be expected of them. They should have ample time to pursue their own studies as the papers they are sent on appointment set out. Now conditions are not envisaged for appointment but it is understood that the position of the lecturer is being formalized by a Bulletin Official announcement along the lines of the report obtainable from ONUE, 36, Bd Raspail, 75272 Paris Cedex 12. All other papers mentioned above can be supplied on request by the department.

Yours faithfully,  
R. A. VAUGHAN,  
Head of Assistants' Department,  
The Central Bureau,  
43 Dorset Street,  
London W1F 3PN.

### Balls Park merger

Sir.—Your references to the closure of Balls Park College, (*THESE*, February 25) gives a very misleading impression. The college, as you note, remains on its present site until September, 1978, when staff and students move over to join the other half of the newly created Ferrifordshire College of Higher Education at Wall Hall.

The merger is very much a reality and is being implemented with the utmost care. They have long worked in close academic association, and the merger is a very different matter from a closure.

Yours sincerely,  
A. K. DAVIES,  
Principal,  
Ferrifordshire College of Higher Education,  
Wall Hall, Wall,  
Worcestershire.

committed to building a new institution incorporating the strengths of the two. They have long worked in close academic association, and the merger is a very different matter from a closure.

Yours sincerely,  
A. K. DAVIES,  
Principal,  
Ferrifordshire College of Higher Education,  
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## An educator extraordinary

John Dewey wrote a vast amount in his long academic career.  
Jo Ann Boydston, director of the Center for Dewey Studies, and Joseph Ratner present a bibliographic guide to his work.

John Dewey was an extraordinary contributor to and participant in American life for some sixty years. He was educator, psychologist, moralist, logician, historian of ideas, philosophical anthropologist, technical philosopher, popularizer of philosophy, essayist, journalist, social-political analyst, aesthetician, wide-ranging activist—often on the side of new or unpopular causes, always on the side that promised enrichment of life. Obviously, it is impossible to present here even a detailed survey of his work. We shall have to be content briefly to sketch his major achievements in major fields.

Since Dewey held that education was the heart and lifeblood of his philosophy, it is appropriate to consider him first of all as educator. In 1930 he wrote:

Although a book called *Democracy and Education* (1916) was for many years that in which my philosophy, such as it is, was most fully expounded, I do not know that philosophic critics, as distinct from teachers, have ever had recourse to it. I have, however, often found that critics signified that philosophers in general, although they are themselves usually teachers, have not taken education with sufficient seriousness for it to occur to them that any rational person could actually think it possible that philosophizing should focus about education as the supreme human interest in which, moreover, all the moral, cosmological, political, logical, come to a head.

Dewey's awareness of the possibilities of education was nurtured during the first decade of his university teaching career (1884-1894) by three main factors: his strong interest in psychology, his careful, often minute, observation of the growth and development of his children (the first three), and his experiences as a member of university teams that visited and evaluated Michigan secondary schools. Urged on by further educational exploration, when he was invited to join the faculty of the newly created University of Chicago in 1894, he accepted on condition that his department include pedagogy as well as philosophy and psychology and, most importantly, that he would be free to establish a laboratory school.

By 1899, the school was well launched and well known. Dewey described the first three years' programmes and experiences in *School and Society*. This slim volume revealed what are the effects of housing an admission Dewey had voiced as early as 1893: "Cease containing education as mere preparation for later life and make of it the full meaning of the present life."

In 1915, *School and Society* was revised and expanded; Dewey was now at Columbia University (1905-1939) and could sum up the evidence and meaning of his unique experiment. Also in 1915, he published with his daughter Evelyn Schools of Tomorrow, an analytic and evaluative survey of selected Deweyan progressive and avant-garde ventures. A year later appeared Dewey's landmark *Democracy and Education*, still used in philosophy of education courses.

Through the years, Dewey's principles were sometimes mislaid, sometimes violently distorted, and sometimes pseudo-disciplines and just-

impulse and habit under certain conditions; it is part of the superstructure rather than the foundations of his new psychology. He nowhere more clearly expounds his conception of the origin and nature of thought, of its role and cultural contributions, than in this book.

Dewey's first extensive treatment of thought was in his first book, but the demise of the soul affected this treatment most calamitously. His major works devoted exclusively or mainly to the reconstruction of his thought are: *Studies in Logical Theory* (1903); *How We Think* (1910, revised 1932); *Essays in Experimental Logic* (1916); *The Quest for Certainty* (1929, Gifford lectures); and *Logic: The Theory of Inquiry* (1938).

Originally schooled in a mild variety of American Hegelianism, he remained true to it in one vital respect: he saw all problems of philosophy as interrelated and logic as the central problem. He summed it up in 1930: "I have long felt that the construction of a logic, that is, a method of effective inquiry, which would apply without abrupt breach of continuity to the fields designated by [science and morals], is at once our needed theoretical solvent and the supply of our greatest practical want. This belief has had much more to do with the development of what I termed, for lack of a better word, 'instrumentalism', than have most of the reasons assigned." Modern scientists developed a "method of effective inquiry" first in physics and astronomy and refined and developed their fields. To be sure, their "method" was adapted to their special needs and purposes. But could not philosophers learn from them? Dewey was certain they could and should, and this "instrumentalism" is scientific method interpreted and adapted to the needs and purposes of philosophy.

He saw scientific method as a highly sophisticated development of common, everyday problem solving. In his philosophy, "instrumentalism," "scientific method," "reflective thinking," "intelligence," are interchangeable terms.

It is a hallowed commonplace that facts and values are worlds apart and the chasm between them can never be bridged. Dewey never believed this; of course not when he was a Hegelian, and again of course not when he was reconstructing logic. During his Hegelian, social psychology period, Dewey published *Outlines of a Critical Theory of Ethics* (1891) and *The Study of Ethics: A Syllabus* (1894). In his subsequent periods, Dewey's major works in this field are: "Logical Conditions of a Scientific Treatment of Morality" (1904); *Ethics*, with James H. Tufts (1908, revised 1932); and *Human Nature and Conduct* (1922).

As we know, Dewey most fully expounded his philosophy first in *Democracy and Education*. Nine years later he did it again in *Experience and Nature* (1925, revised 1929). In the latter work he expounded his philosophy in the form of art, when reflected upon, solves more problems which have troubled philosophers and resolves more hard and fast dualisms than any other work he wrote. Dewey developed this "theory of thought" fully

in *Art as Experience* (1934). The basic purpose or theme of this work is "to restore continuity between the refined and intensified forms of experience that are works of art and the everyday events, doings, and sufferings that are universally recognized to constitute experience." This rounds out Dewey's 1930 statement on the theme of "effective inquiry" by explicitly including in his continuum of inquiry artistic aesthetic experience. Fundamentally, there is nothing he says about art values in *Art as Experience* that he did not say 12 years earlier about moral values in *Human Nature and Conduct*. But what a difference in the saying!

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When it was reprinted in 1942, Dewey brought it up to date with a long introductory essay.

Unique among Dewey's popularizing efforts is *Reconstruction in Philosophy* (1920), the outcome of lectures at Japan's Imperial University. It expounds Dewey's philosophy more comprehensively than does *Democracy and Education*. In 1948, *Reconstruction in Philosophy* was replaced by a forty-page new introduction in which Dewey evaluates what happened in philosophy, his own included, in the intervening years. For initiation in the history of Dewey's philosophy, nothing is better than this 1948 edition which continues to have wide readership outside and inside American colleges and universities.

Dewey began his journalistic career in 1885 as editorial writer for the *Christian Union*, a national publication. Although he was not busy with his laboratory school to continue journalistic writing while at Chicago, journalism became a permanent and expanding part of his activity in New York, especially after the founding of the *New Republic* (1914), of which he was a "contributing editor" for many years. He was, however, always the philosopher, not least his journalism.

Early in his career he planned a monthly newspaper to be called "Thought News." Dewey carefully explained that the aim of his newspaper was "to perform the function of a newspaper." It would simply "set forth" carefully selected interrelated facts "instead of dwelling at length upon the moral individual processes that accompany the facts"; and it would "not discuss philosophical ideas per se but use them as tools in interpreting the movements of thought [in science, letters, state, school and church]" as facts of the one moving life of man and hence of common interest. *Thought News* never met its first deadline, April 22, 1892.

Involved in Dewey's conception of his newspaper "Thought News" was the idea then held by some American Hegellians that the newspaper was (or should become) a manifestation of the "Third Person" of the Trinity. The invocation of the Third Person did not imply belief in the Trinity nor was it a "test." The Hegelian heavenly reference does not seem so outlandish if for "newspaper" we substitute "communication." Is there something "divine" in communication in any of its forms? *Reconstruction in Philosophy*, Dewey speaks of "the mystic force one might

say, of communication, of the mystic of shared life and shared experience"; and in *Experience and Nature*, "Of all affairs, communication is the most wonderful... and that the fruit of communication should be participation, sharing, is a wonder by the side of which transubstantiation pales." The miracle and the wonder are not Dewey's religion. As he explained in *A Common Faith* (1934), he has no religion, natural or supernatural, with or without institutional equipment; his sole religious belief is in the cosmic reality of a "religious quality" that experience achieves, given a favourable complex of conditions which he carefully specifies and describes.

Dewey's participation in the democratic process in the public domain was not limited to journalism. He wrote four short, powerful tracts for the times: *The Public and Its Problems* (1927), *Individualism, Old and New* (1931), *Liberalism and Social Action* (1935), and *Freedom and Culture* (1939). He even marched in New York streets for women's suffrage.

Henry Steele Commager summed up Dewey's activism: "the spearhead of a dozen movements, the leader of a score of crusades, the spokesman of a hundred reforms."

The Center for Dewey Studies was founded in 1961 at Southern Illinois University at Carbondale to collect, edit, and publish Dewey's works. Only after several years of collecting was it realized how much Dewey had written in 70 years, during most of them by a two-finger typist on overworked portables. We can have no more than a bare indication of the magnitude of the undertaking. Each volume in the published works is planned to have some 500 pages; there are five volumes of *The Early Works* (1882-1898), all already published; 15 volumes of *The Middle Works*, 1899-1924, four volumes published; 25 volumes of *The Later Works*, 1925-1952; *The Poems of John Dewey* (not included in the above) to be published in July 1977.

Decisions regarding the publication of Dewey's professional correspondence have still to be made. This project will require his cooperative assistance. 10 volumes for future consideration there remain Dewey's personal correspondence and large quantities of other materials. Whether everything Dewey has written will be included in *The Collected Works* will depend upon the next generation, or two (or three) at the Center and on the Southern Illinois University Press.



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The Development of Microbiology by Patrick Collard Cambridge University Press £6.50 ISBN 0 521 21177 8

Professor Collard's short book is neither an exhaustive presentation of historical fact nor a popular account of microbiology which simply highlights dramatic medical events.

The author clearly finds his subject from the mid-nineteenth century and, while the historical might comment on the omission of some distinguished contributors and on some points of precedence, other workers receive due, if hitherto unremarked, recognition.

The emphasis throughout is on development rather than on the cataloguing of facts. A broad and balanced perspective relates the past through the historical present to the foreseeable future and the deeds and insights of the dramatic personae are marshalled as continuously moving and reconstructed models, elaborated or simplified to comprehend new advances, particularly in the chapters on chemotherapy, metabolism, genetics, serology and immunology and theories of antibody formation.

Even the accounts of culture media and bacterial classification are saved from the tedium which they sometimes engender by their coherence and careful selection of detail to illustrate principles.

The book covers much ground, and each chapter is followed by a list of references, many of them from the French and German literature and dating mainly from the late 1960s. It is probably right that future historians should be left to evaluate more recent developments. However, the specialist in virology, mycology and cellular immunology might feel a little deprived and the epidemiologist, the practitioner of antiseptics and the student of pathogens receive scant mention in a volume which shows a distinct, though tempered, medical bias.

Separate indexes of subjects and names are useful, but the 50 figures, including 38 photographs of individuals, are perhaps more suitable for the lecture room. Names of men, organisms and drugs are frequently misspelled and references are sometimes inaccurate; there are some factual inaccuracies. But the material for this book has been critically selected, assembled with imagination and experience, and well-written.

R. G. Postlethwaite

WITWATERSRAND UNIVERSITY PRESS 1 Jan Smuts Avenue, Johannesburg 2001

Scholarly publishers since 1923, our list reflects an emphasis on African, particularly Southern African, languages, literature, history, anthropology, archaeology and biology. Please write for a catalogue

Demography

Demographic Anthropology: Quantitative Approaches by Eran D. Zubrow University of New Mexico Press, \$20.00 ISBN 0 8263 0413 3

World population is increasing at 200,000 persons a day. If trends continue, it will be increasing by half a million persons a day by the end of the century. It was partly in this context that a group of cultural and physical anthropologists and archaeologists, most of them world authorities, met at a seminar in 1973 to discuss the causes and consequences of population growth.

The archaeological approach is represented by articles by Cavalli-Sforza and his associates, in which they attempt to devise new ways of estimating population growth in old world prehistory, particularly by examining the volume of rubble produced by fallen dwellings. Longacre reports on a project on an Arizonan pueblo from the nineteenth century. A broad and balanced perspective relates the past through the historical present to the foreseeable future and the deeds and insights of the dramatic personae are marshalled as continuously moving and reconstructed models, elaborated or simplified to comprehend new advances, particularly in the chapters on chemotherapy, metabolism, genetics, serology and immunology and theories of antibody formation.

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BOOKS



An ancestor headress, possibly representing a chief hunter, in wool and painted, is one of the many illustrations in a study of the Yoruba people of south-western Nigeria and Dahomey, Black Gods and Kings by Robert Farris Thompson. It is published by the University of Indiana Press at £13.85.

Of mines and men

Studies in the Yorkshire Coal Industry by J. Benson and R. G. Neville Manchester University Press, £7.95 ISBN 0 7190 0643 0

One of the most notable gaps in the literature of the coal mining industry and of miners' trade unionism is the comparative neglect of developments in Yorkshire. As the premier coal-producing district in Britain and the home of the country's first permanent miners' trade union, it is clearly time that a serious study was made of the county. Not only would this prove a welcome addition to the existing stock of regional studies of the coal fields, but, equally important, it would help historians to determine further the extent to which generalizations about the progress and development of the coal industry adopted from a national perspective need modification as evidence of another powerful regional influence comes to light.

This volume does not pretend to provide a definitive account of any of the many facets of Yorkshire in the past, but it is a well-timed and well-written study of the county's social, industrial and labour history, almost as if to emphasize the need for a more complete and balanced approach to the whole subject. The seven individual contributions are interesting in themselves, each painstakingly researched and well-written. They cover aspects of mining safety and compensation for industrial injury, the development of Yorkshire coal industry in earliest times to the Second World War, the part played by miners' country landowners in the county's wealth, the employment relations between the unions and the Yorkshire Miners' Association in the wake of the 1926 strike, the comparative neglect of developments in Yorkshire. As the premier coal-producing district in Britain and the home of the country's first permanent miners' trade union, it is clearly time that a serious study was made of the county.

W. R. Gordon

BOOKS

Polyhedra: A Visual Approach by Anthony Pugh University of California Press, £3.50 ISBN 0 520 03056 7

An Introduction to Tensegrity by Anthony Pugh University of California Press, £3.50 ISBN 0 520 03055 9

Geodesic Math and How to Use It by Hugh Kauner University of California Press, £3.95 ISBN 0 520 03524 0

These three books in the Dome Series are announced as "practical books for the architect or engineer who works with geodesic structures, resource books for mathematical hobbyists and model builders, text-books for students of design and design books for anyone who wants to understand the tensile forces that keep these apparently flimsy structures intact". They follow the independently produced Domebooks and Shelter in formalizing the work of Buckminster Fuller, Lloyd Kahn, Kenneth Snelson and others.

Geodesic and tensegrity structures have been known for about 20 years, but it has been notoriously difficult to obtain any reliable details on their methods of construction or a simple analysis of their structural principles. Ironically, we rely on a professor of English to show us how accessible these ideas of "geodesic math" really are.

There are many books on polyhedra, but this one is written particularly with geodesic structures in mind, to encourage the non-mathematician to explore regular and semi-regular convex polyhedra, their duals, prisms and anti-prisms, as well as the potential of several families of polyhedra, including configurations obtained by joining several together. What is new is the detail of triangulation of plane faces to obtain square or triangular openings, and the technique of construction so that a cap of a given size may be made to stand on a plane polygonal base.

Useful appendices contain basic formulas and worked examples, hints on model building, chord factors for chords subtended by angles at the centre expressed as a function of the radius of the circumscribing sphere. This last is a welcome collection which enables many polyhedra to be constructed with a high degree of accuracy. Even though some of this may be considered fairly standard stuff, the approach is attractive and easy to follow, and I prefer it to many of the books available.

The structural roles of tension and compression are known from elementary statics, and if we imagine a polyhedral skeleton where the rods in tension are replaced by wires, we can develop some most amazing looking tensegrity structures. We find that a "tensegrity" system is established when a set of discontinuous compressive components interacts with a set of continuous tensile components to define a stable volume in space. If we construct a continuous tensile network, we have tensional integrity—"tensegrity"—a system with structural stability which oscillates about a minimum energy state.

Leo Rogers

Nuclear warning

The Accident Hazards of Nuclear Power Plants by R. E. Webb University of Massachusetts Press, \$6.95 ISBN 0 87023 210 X

Richard E. Webb discusses the many possible accidents and their associated hazards which can arise in the operation of nuclear power plants. After a description of the basic problems of reactor safety, chapters are devoted to types of reactor accidents, design basic accidents, worst possible accidents, and accident probabilities.

Other chapters review some of the major safety reports published in the USA, and one chapter is entirely devoted to the hazards of the fast breeder reactor. An appendix summarizes briefly the accidents which have actually occurred on operational plants.

It is difficult to determine which readers the author is aiming at since safety under the established regulations are not given in sufficient detail while in the reactor safety field, while I suspect that layreaders will find a lot of the discussion difficult to grasp and not a little confusing.

The aim of the book is to emphasize the hazards of nuclear reactors, and to show how unsafe they are. The author concludes that nuclear power plants should be shut down pending more experimental safety information. It would have been advantageous to have been given more of the other side of the coin, thereby appealing to a larger public.

John Shaw

BOOKS

NEW PAPERBACKS: A HISTORY OF THE GREEK CITY STATES, 700-338 B.C. Raphael Sealey

This book introduces the reader to the serious study of Greek history, concentrating more on problems than on narrative. Outlined are controversial issues of which differing views can be defended. Mr Sealey's preference is for interpretations which see Greek history as the interaction of personalities, rather than for those which see it as a struggle of economic classes or of abstract ideas.

THE HOMERIC HYMNS Translated by Apostolos N. Athanassakis

Offering a straightforward, line-by-line translation, Athanassakis preserves the priceless plainness that exists in both the Homeric epic and the Homeric hymns. Reliable, imaginative, but free of stylistic contortions, and above all unpretentiously elegant and clear, this new translation is bound to remain for a long time to come the Greekless reader's best next thing to the original.

TRACES ON THE RHODIAN SHORE Nature and Culture in Western Thought from Ancient Times to the End of the Eighteenth Century. Clarence J. Glacken

"The learning of this book is immense, the range unbounded, the scholarly apparatus admirable, and the writing... full of zest."

THE ROCK PAINTINGS OF THE CHUMASH Cambell Grant

"The book is lavishly illustrated with photographs of the sites, coloured transcripts of the paintings, and inventories of the pictographic elements used. The author also gives an exhaustive historical and anthropological account of the Chumash tribe."

FAMILY AND SOCIETY Selections from the Annals: Economics, Societies, Civilization, Volume 2 Edited by Robert Forster and Orest Ranum

This book treats all aspects of family life from the time of the Roman Empire to the eighteenth century in Europe. It explores child-rearing customs, inheritance laws, dowries and marriage practices, illegitimate births, fertility and industrialization and the rise of peasant and elite families.

MOVIES AND METHODS Edited by Bill Nichols

Film teachers and students will welcome this new anthology, which makes available a comprehensive selection of recent theoretical work on film—including many articles difficult to locate in the scattered literature.

PROGRAMS IN AID OF THE POOR Third Edition Sar A. Levitan

This concise overview of America's complex system of anti-poverty programs has been thoroughly revised and updated. The book provides an ideal introduction to the three major kinds of aid programs.

GEODESIC MATH AND HOW TO USE IT Hugh Kauner

INTRODUCTION TO TENSEGRITY Sar A. Levitan

POLYHEDRA: A VISUAL APPROACH Anthony Pugh

THE PHILIPPINES Priorities and Prospects for Development Russell J. Chatham and Edward J. Hawkins

New Books

ARAB NATIONALISM An Anthology Edited by Sylvia G. Haim

"Sylvia Haim... has carefully selected, translated and edited a vitally important group of articles, essays, manifestoes and other documents which represent the absence of Arab nationalism."

ENERGY SUPPLY AND GOVERNMENT POLICY Edited by Robert J. Kaller and William Vogely

Fundamental questions about America's energy supplies are faced and answered in this collection of essays by seventeen specialists. The fourteen essays, written from a variety of perspectives, describe current U.S. government policies and explain their economic, institutional and environmental implications.

PILLS, PROFITS AND POLITICS Milton Silverman and Philip R. Lee

"A factual, sober appraisal of the American medicinal drug scene during the last dozen turbulent years... Silverman and Lee's critique is so inclusive, their evidence so extensive, their opinions so candid and their proposed reforms so explicit, their book deserves a wide audience."

LANDSAT INDEX ATLAS OF DEVELOPING COUNTRIES OF THE WORLD

This atlas makes available imagery produced over a three year period by the Landsat unmanned earth satellite. The fourteen maps in the index represent a new era of information in such fields as cartography, land use classification, agriculture, forestry, hydrological resources and marine studies, environmental monitoring, geology and regional planning.

THE TROPICS AND ECONOMIC DEVELOPMENT Andrew M. Kamark

Why has the developing world lagged in the world wide process of modern economic growth? The author suggests that prevalent theories addressing this question often disregard the facts and neglect the real problems of Third World countries.

NUTRITION AND POVERTY Scholmo Raullinger and Marcelo Selowky

This study assesses the character and magnitude of nutritional deficiency in the developing countries and analyzes the cost effectiveness of selected policy instruments in reducing the deficiencies.

VILLAGE WATER SUPPLY Economics and the Policy in the Developing World Robert J. Saunders and Jeremy J. Warder

The great majority of persons in rural areas of the developing world do not have access to a safe and convenient source of water for drinking, personal hygiene, and other domestic purposes. The authors examine in this book a wide range of factors—physical, social and economic—that must be dealt with in improving the adequacy of water supply and sanitation in the years ahead.

THE PHILIPPINES Priorities and Prospects for Development Russell J. Chatham and Edward J. Hawkins

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The University Presses of CALIFORNIA, CORNELL, JOHNS HOPKINS 2-4 Brook Street, London, W1







Universities continued

SOUTHAMPTON THE UNIVERSITY... NORTH WALLES UNIVERSITY COLLEGE OF DEPARTMENT OF ARCHITECTURE

THE OPEN UNIVERSITY ASSISTANT ADVISOR OF EDUCATION... THE UNIVERSITY OF EXETER DEPARTMENT OF EXPERIMENTAL PSYCHOLOGY

OXFORD THE UNIVERSITY DEPARTMENT OF EXPERIMENTAL PSYCHOLOGY... SHEFFIELD THE UNIVERSITY

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Fellowships and Studentships

RESEARCH FELLOWSHIP INSTITUTE OF SOCIAL AND ECONOMIC RESEARCH RHODES UNIVERSITY

Grahamstown South Africa

The University Fellowship tenable at the Institute is offered for the calendar year 1978 or for the period July 1978 to July 1979.

The Fellow will be required to engage in full-time research in any field within the broad range of the Social Sciences...

The emoluments of the Fellowship are at the rate of R6,000 per annum... Further particulars may be obtained from the Registrar...

UNIVERSITY COLLEGE, OXFORD

Weir Fellowship in Politics

The college proposes to elect, with effect from 1 October, 1977, or as soon as possible thereafter, a Fellow and Tutor in Politics...

BRISTOL THE UNIVERSITY

JAMES WATTS HAVELING FELLOWSHIP 1977

The James Watt Memorial Foundation Fellowship offering a sum of £3,000 in each year...

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Polytechnics

ULSTER COLLEGE THE NORTHERN IRELAND POLYTECHNIC SENIOR LECTURER or LECTURER II-French Literature LECTURER II-Graphic Design

Applicants should have experience in one or more of the following fields: Central studio and workshop techniques...

The Polytechnic is a direct grant institution with an independent Board of Governors... Further particulars and application forms...

Teesside Polytechnic DEPARTMENT OF ART AND DESIGN

Applications are invited for the following posts: 1 LECTURER II SENIOR LECTURER IN INTERIOR DESIGN... 1 LECTURER II SENIOR LECTURER IN HISTORY OF ART AND DESIGN

Further details and form of application from the Chief Administrative Officer, Trent Polytechnic...

Teesside Polytechnic HEAD OF DEPT. OF MATHEMATICS (Grade V)

Due to the retirement of the present Head a vacancy will occur from September 1977 for a person to take charge of this well established department...

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Polytechnics continued

Faculty of Human Sciences Department of Health and Social Studies Principal Lecturer in Social Work

Applicants should have a good degree in a relevant subject and be professionally qualified... Salary Scale, Principal Lecturer £5,940 to £7,578

NELP North East London Polytechnic

Head of Department VISUAL COMMUNICATION

The department conducts a range of advanced work in Graphics, Photography and Printing... Salary: Grade V £7,395 to £8,271 plus £312 supplement.

TRENT POLYTECHNIC NOTTINGHAM

THE POLYTECHNIC HUDDERSFIELD Department of Behavioural Sciences

LECTURER II-SOCIOLOGY

Applications are invited from good honours graduates to teach sociological methods and urban sociology... Salary: £7,395 to £8,271 plus £312 supplement

LONDON THE POLYTECHNIC SCHOOL OF HUMANITIES DIVISION OF HISTORY

LECTURER IN HISTORIOGRAPHY

MANCHESTER THE POLYTECHNIC DEPARTMENT OF APPLIED ECONOMY STUDIES

LECTURER IN ECONOMIC HISTORY

MANCHESTER THE POLYTECHNIC DEPARTMENT OF APPLIED ECONOMY STUDIES

MANCHESTER THE POLYTECHNIC DEPARTMENT OF APPLIED ECONOMY STUDIES

Courses

BRISTOL THE UNIVERSITY DEPARTMENT OF EDUCATION

TEMPORARY LECTURERS IN BIOLOGY AND IN PHYSICAL SCIENCES

TEMPORARY LECTURER GRADE II (BIOLOGY)

TEMPORARY LECTURER GRADE II (PHYSICAL SCIENCES)

MANCHESTER THE POLYTECHNIC RESEARCH ASSISTANTSHIP IN FILM HISTORY

RESEARCH ASSISTANTSHIP IN FILM HISTORY

BIRMINGHAM THE POLYTECHNIC DEPARTMENT OF COMPUTER SCIENCE AND MATHEMATICS

LECTURER II SENIOR LECTURER IN STATISTICS AND OPERATIONAL RESEARCH

MANCHESTER THE POLYTECHNIC RESEARCH ASSISTANTSHIP IN FILM HISTORY

MANCHESTER THE POLYTECHNIC SOCIAL SCIENCE RESEARCH ASSISTANTSHIP

MANCHESTER THE POLYTECHNIC RESEARCH ASSISTANTSHIP

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MANCHESTER THE POLYTECHNIC RESEARCH ASSISTANTSHIP



TEMPORARY LECTURERS IN BIOLOGY AND IN PHYSICAL SCIENCES

Applicants are invited from holders of a first class honours degree in the following subjects...

TEMPORARY LECTURER GRADE II (BIOLOGY)

TEMPORARY LECTURER GRADE II (PHYSICAL SCIENCES)

TEMPORARY LECTURER GRADE II (PHYSICAL SCIENCES)

Colchester Institute of Higher Education Sheepsen Road, Colchester

Head of School of Music

The School of Music offers courses for a B.A. (Music) Honours Degree and Certificate (C.N.A.A.) and for a range of Certificate and Diploma examinations...

Application form, available from the Director, to be returned by April 15, 1977.

Essex County Council

RESEARCH OFFICER Design Education

The Design Council has a vacancy for a Research Officer in its recently expanded Education Section...

Further information and application forms may be obtained from the Principal Administrator...

Design Council

Design Council

Design Council

Handwritten note: 1000

General Vacancies

Senior Nuclear Structure Experimentalist

Applications are invited for the post of Senior Nuclear Structure Experimentalist at the Daresbury Laboratory. The duties of the post, which is in the Nuclear Structure Division of the Laboratory, will be to manage the research programme of the 30 million volt tandem electrostatic accelerator at present under construction. The work will cover the organisation and administration of the programme of experiments, and the provision of the equipment and facilities necessary to support the programme, in liaison with the University Groups carrying out research on the accelerator. The person appointed will be head of a group of some 20 scientific and other staff, and in addition the responsibilities will cover the work of staff from other Divisions supporting the experimental programme.

The successful candidate, who will be expected to be an active collaborator in the research undertaken on the accelerator, will be a physicist having considerable experience in the field of nuclear structure physics with a wide knowledge of the current areas of interest and the techniques applicable to the field. A knowledge of related fields, such as atomic physics and radio chemistry, would be an advantage. Starting salary will be assessed according to qualifications and experience, and is expected to be within the scale £8,850 to £9,750. The supernannation scheme is non-contributory. Applicants (male or female) should write to the Director and provide details of qualifications and experience. Reference Number: DL/585/BT Closing date: April 29, 1977.



SCIENCE RESEARCH COUNCIL

DARESBURY LABORATORY

Personnel Officer, Science Research Council, Daresbury Laboratory, Warrington WA4 4AD.

Secretary/Assistant Secondary Education

The Confederation of British Industry is looking for an Assistant to work in the Education Training and Technology Directorate, dealing with work concerning employers' requirements from the secondary education system.

You will act as Secretary to the joint CBI/Schools Panel (an advisory body made up of employers and head teachers), and be concerned with issues such as school examinations and curricula, and encouraging links between schools and industry.

You will be expected to draft CBI policy papers and present them and also to represent the CBI on external bodies in this field.

A degree or equivalent is essential, and preferably some experience of the schools/industry field. You will be offered a salary of around £3000 per annum, according to age and experience. Please write for application form to Jape Hopkins, CBI, 21 Tottil Street, London, SW1H 0LP, quoting reference number ET.9.

YORKSHIRE ARTS ASSOCIATION

requires a

Film Officer

Salary on the AP4/SO1 Local Government Scale - £3,386 to £4,545 with supplement of £312. The appointment will probably start on the AP4 scale.

Further details/application forms (returnable by 13th April, 1977) from:

Michael Dawson, Director, Yorkshire Arts Association, Glyde House, Glydegate, Bradford BD5 0BQ.

LONDON, S.W.13 ST. PAUL'S SCHOOL.

There will be a vacancy in the Department of Music to teach MAJOR and MINOR forms of music up to university standard. The post is full-time and will be held in the school's own music centre. The successful candidate will be expected to have a high level of musical ability and to be able to play a variety of instruments. The successful candidate will be expected to have a high level of musical ability and to be able to play a variety of instruments. The successful candidate will be expected to have a high level of musical ability and to be able to play a variety of instruments.

Administration

EQUAL OPPORTUNITIES COMMISSION

Development Officer (Education Administration) Salary Scale £5,520 to £7,740 plus £1,500 pay supplement. Applications are invited from suitably qualified persons for the post of Higher Education Officer in the Commission under the direction of the Director of Education Administration. This is a full-time post with a salary in the range of £5,520 to £7,740 plus a supplement of £1,500. The successful candidate will be expected to have a high level of administrative ability and to be able to play a variety of instruments. The successful candidate will be expected to have a high level of administrative ability and to be able to play a variety of instruments.

LONDON THE FINANCIAL INFORMATION CLUB. The unit was established by the Director of State for Education and Science on January 1, 1977. Its Director of Management and First Director have been appointed, and two Development Officers are now required to take major responsibilities for devising and implementing the Unit's programmes and activities. Applicants should have worked in further education and/or the training services, have a sound knowledge and experience of curriculum development in these areas, be able to work with staff in a variety of institutions, and possess considerable personal initiative. The Development Officers will be based in London, but their work will involve considerable travel. Salary scale £5,520 to £7,740 plus a supplement of £1,500. The successful candidate will be expected to have a high level of administrative ability and to be able to play a variety of instruments. The successful candidate will be expected to have a high level of administrative ability and to be able to play a variety of instruments.

Classified Advertisements To advertise in THE TIMES Higher Education Supplement. New Printing House Square, P.O. Box 7, Gray's Inn Road, London WC1X 8EZ.

Overseas

QUEENSLAND INSTITUTE OF TECHNOLOGY BRISBANE-AUSTRALIA LECTURER/SENIOR LECTURER

The School of Law commenced teaching in February, 1977, when some 200 students were accepted for a four year full-time course or a six year part-time course leading to a Law degree. In 1977, the following Law subjects are being taught: Introduction to Law, Contract and Torts, Criminal Law and Procedure, Land Law and Constitutional Law will be introduced in 1978. Eight appointments to the academic staff of the Law School have so far been made and the Institute is now contemplating making two further appointments. Applications are invited from suitably qualified persons who can take up their duties between October 1st and December 31st, 1977, with a view to commencing teaching in February, 1978. Applicants should possess appropriate academic qualifications in Law. Practical experience and teaching experience at the tertiary level would be distinct advantages. Successful applicants will be given the opportunity to engage in further study, research and consultation, subject to the control of the Institute Council.

Salary: Lecturer II - \$13,850 to \$15,125. Lecturer I - \$16,314 to \$18,789. Sen. Lecturer II - \$18,794 to \$20,170. Senior Lecturer I - \$20,730 to \$22,010. Appointments will be made within the above salary ranges according to qualifications and experience. An allowance is payable for travel and removal expenses. Further information may be obtained from the Personnel Officer (address below).

Applications, quoting V.40/77 and stating personal details, academic qualifications, practical and teaching experience, present employment areas of particular interest or expertise and the names and addresses of two referees should reach the:

Personnel Officer Q.I.T. P.O. Box 246, North Quay, Brisbane 4000 by Monday, 11th April 1977 (P.400)

AUSTRALIA



The Victorian College of the Arts

The Victorian College of the Arts was established in Melbourne in 1973 as a College of Advanced Education to conduct courses at diploma and degree level in the fine and performing arts. The Schools of Art, Music and Drama are already operating. The School of Dance is to open to students in February 1979. A Junior School, for young dancers and musicians, is planned to open in 1978. The College is adjacent to the Victorian Arts Centre. The Director of the College is Mr. Lenton Parr.

DEAN SCHOOL OF DANCE

DUTIES: To be responsible for the planning, conduct and development of the School. This will initially involve planning courses, securing an appointment of staff and plans for the building programme. QUALIFICATIONS: Applicants should have achieved professional distinction in the field of dance and/or have experience in dance education. The appointee will be expected to take up duties late in 1977. SALARY: A\$27,500 (plus). Further information - Details of the position, the College and the information to be included in application are available on request to:

The Administrator, The Victorian College of the Arts 234 St. Kilda Road, Melbourne, Victoria 3004, Australia.

All correspondence should be marked 'Confidential'. Applications should be lodged by 1 May 1977.

CLASSIFIED

To advertise in THE TIMES HIGHER EDUCATION Supplement. New Printing House Square, P.O. Box 7, Gray's Inn Road, London WC1X 8EZ.

Overseas continued

CHURCHLANDS COLLEGE Perth, Western Australia

Churchlands College is situated six miles from the centre of Perth, the capital, and was established in 1972. In 1976 a Bachelor of Business Degree course was commenced and there are now some 500 students enrolled. By 1980, it is estimated that there will be some 1,000 students in the Business Studies programme.

Teacher Education is the other main programme in the college and, in 1977, some 1,200 students are enrolled.

VISITING FELLOW IN FINANCE

Nominations are invited for the position of Visiting Fellow in Finance for Semester 1, 1978 (February-June, 1978). The appointee will conduct seminars for final year students in the Finance Stream of the Bachelor of Business course.

The Visiting Fellow will be expected to have very good relevant experience and to have demonstrated a strong recent background in the field of finance, either by publication, or by a research graduate-level degree. Salary and travel arrangements will be negotiated.

Enquiries are also invited from suitably qualified persons who may be interested in appointment as a Visiting Fellow in Finance in Semester 1, 1978, or Semester 1, 1980, or in Semester 1, 1981.

BUSINESS STUDIES PROGRAMME

Applications are invited from suitably qualified persons with relevant experience for the following positions. Appointments will be made to commence teaching in February, 1978.

Level of Appointment: Appointments may be made either at the Senior Lecturer level, Lecturer level, or Senior Tutor level, depending on qualifications and experience.

ACCOUNTING

DUTIES: To teach accounting subjects, to assist in the preparation of other courses and to develop units of study offered by the School of Business Studies.

ECONOMICS AND QUANTITATIVE METHODS

DUTIES: To teach in at least two of the following areas: Economics, Quantitative Methods, Marketing, Business Systems.

ADMINISTRATIVE STUDIES

DUTIES: To teach in at least two of the following areas: Organisation Theory, Individuals and Organisations, Management Processes, Organisation Structure and Design, Management Policy, Personnel, Industrial Relations, Small Business Management, and International Business.

FINANCE

DUTIES: To teach in at least two of the following areas: Australian Capital Market, Security Analysis, The Investment Decision, The Financing Decision, Topics in Finance and Small Business Management, Banking, and Insurance.

BUSINESS WORKSHOP

DUTIES: To assist in developing and creating material with a multi-disciplinary approach, for the Business Workshop. To conduct workshop sessions and/or seminars and act as a catalyst. To assist in tutoring and maintaining contact with the public and private sectors, and sister institutions.

CLAREMONT TEACHERS' COLLEGE (A College of Advanced Education)

WESTERN AUSTRALIA Applications are invited from suitably qualified persons to fill SENIOR TUTOR/LECTURER positions in 1978 in the following areas:

SPECIAL EDUCATION

The appointee will be expected under the direction of the Head of the Department to participate in the teaching of courses in special education, remedial education and, if required, in educational psychology. He will also assist, if required, in teaching practice supervision, teaching workshop and student counselling.

EDUCATIONAL PSYCHOLOGY

The appointee will be expected, under the direction of the Head of the Department, to participate in the teaching of courses in educational psychology and, if required, in special education. He will also assist, if required, in teaching practice supervision, teaching workshop and student counselling.

Salary and Conditions of Service: Salary will be negotiated at time of appointment.

LECTURER \$13,519-\$18,078 (Australian) SENIOR LECTURER \$11,746-\$13,518 (Australian) (Salaries are currently under review). Conditions of service are comparable with those in Universities and Colleges of Advanced Education in Australia.

Applications: Details of conditions of service, duties, relevant qualifications and application forms may be obtained from:

THE REGISTRAR, CLAREMONT TEACHERS' COLLEGE, P.O. BOX 224, CLAREMONT, 6101, WESTERN AUSTRALIA.

Applications should reach the College by June 20, 1977.

CSIRO AUSTRALIA DIVISION OF BUILDING RESEARCH HIGHTT, VICTORIA

SOCIAL/BEHAVIOURAL SCIENTIST

The Commonwealth Scientific and Industrial Research Organisation has a broad charter for research into primary and secondary industry areas. The Organisation has approximately 7,000 employees—2,200 of whom are research and professional scientists—located in Divisions and Sections throughout Australia.

GENERAL: The Division undertakes a very wide range of theoretical and applied research concerned with building and the built environment, recently extended to social and behavioural problems in rural and urban environments. Community problems are being attacked from a variety of viewpoints by a group comprising architects, sociologists, psychologists and geographers. Among problems being studied at present are remote communities, symbolic and social characteristics of housing, sociological and psychological aspects of community decision-making, and intra-urban migration.

Research Scientists have considerable autonomy, as well as the opportunity to join in multi-disciplinary approaches to complex problems.

DUTIES: To undertake research in the area of human behaviour in the built environment.

QUALIFICATIONS: A Ph.D. in social psychology, sociology or geography, and demonstrable research ability. A lower degree plus appropriate research experience will be considered.

SALARY: Research Scientist or Senior Research Scientist: \$A13,517 to \$A19,919 p.a.

TENURE: Indefinite or fixed term.

Applications stating FULL personal and professional details, the names of at least two professional referees and quoting reference number 380/591 should reach:

The Personnel Officer, Australian Scientific Liaison Office, Canberra House, 10-16 Malltravers Street, London WC2R 3EH, by 15th April, 1977.

RMIT AUSTRALIA

SENIOR LECTURER-TEXTILE DESIGN (PRINTED & WOVEN)

SCHOOL OF ART DEPARTMENT OF DESIGN

Applications are invited for the position of Senior Lecturer in Textile Design.

Applicants should possess a tertiary level qualification in textile. A breadth of practical experience in industry and a background of teaching in tertiary institutions relevant to the position is desirable. Management or administrative experience in either industry or education is essential.

The appointee will be required to teach Textile Design and undertake other duties as detailed in the Schedule of Duties.

Salary within the range \$A18,795 - \$A22,010 p.a.

Ref. No. 152/15/AS Closing Date: 29.4.1977

Intending applicants should obtain a Schedule of Duties from the Staff Branch, Royal Melbourne Institute of Technology, Box 2476V, G.P.O. Melbourne, Australia, 3001.

Written applications should be addressed to the Registrar, Royal Melbourne Institute of Technology.

AUSTRALIA

WARRNAMBOOL INSTITUTE OF ADVANCED EDUCATION

Lecturer in Sociology

FACULTY OF GENERAL STUDIES

The Faculty offers two courses: A Diploma of Social Science and a Bachelor of Social Science. It also teaches both the humanities and a broad range of social sciences.

DUTIES: To assist in the development and teaching of sociology courses.

QUALIFICATIONS: Applicants should have an Honours or higher degree in sociology. They should have a substantial background in sociological theory and method, and a keen interest in current developments. An interest in political sociology may be an advantage. Experience in tutoring or teaching will be considered as an advantage.

SALARY: Lecturer 11 \$A13,850 to \$A19,925 per annum Lecturer 1 \$A12,514 to \$A16,389 per annum

Commencing salary according to qualifications and experience.

An applicant with appropriate qualifications and experience may be appointed at a higher level.

Applications close 11th April, 1977. Further particulars may be obtained from the Staffing Officer and written applications stating qualifications, experience and giving the names and addresses of three referees should be addressed to the Staffing Officer, P.O. Box 423, Warrnambool, Victoria.

FOR FURTHER OVERSEAS APPOINTMENTS SEE PAGE 2